

(25,169)

(25,170)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1916.

No. 403.

E. W. BLISS COMPANY, APPELLANT,

vs.

THE UNITED STATES.

No. 404.

THE UNITED STATES, APPELLANT,

vs.

E. W. BLISS COMPANY.

APPEALS FROM THE UNITED STATES CIRCUIT COURT OF APPEALS
FOR THE SECOND CIRCUIT.

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Bill of Complaint as Amended.

United States District Court, Eastern District of New York.

In Equity.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

To the Honorable the Judges of the District Court of the United States for the Eastern District of New York:

The United States of America, by William J. Youngs, its attorney, for the Eastern District of New York, sues the E. W. Bliss Company, and your orator alleges on information and belief as follows:

First. That the United States of America, the complainant, is a sovereign government, and now, and at all the times hereinafter mentioned as such government, was, and has exercised and exercises, possessed and is possessing the power of government in the said United States of America, and has jurisdiction and authority over all matters relating to the building of, equipment and administration of the Navy Department of the United States, and execution of all the laws of the United States in relation thereto.

Second. That the E. W. Bliss Company is a corporation incorporated under the laws of the State of West Virginia, and doing business in the United States, and particularly in the Borough of Brooklyn, in the State and Eastern District of New York, at which its principal place of business is located.

2 Third. That on or about the twenty-second day of November, nineteen hundred and five, the E. W. Bliss Company, being then and there such corporation as afore-said, did make, execute and deliver to the complainant, represented by the Chief of the Bureau of Ordnance, acting under the direction of the Secretary of the Navy of the United States, a certain contract in writing bearing date of that day, wherein and whereby it did, amongst other things, agree that it would, at its own risk and expense, manufacture in conformity with drawings, plans and specifications approved by the Chief of the Bureau of Ordnance on October 23, 1905, which said plans and specifications are on file in the Navy Department of the United States, a copy of which is in the possession of the defendant herein, and will be produced upon the trial of this action, which complainant prays may be considered as incorporated in the body of this complaint, 300 torpedoes of the kind designated and known as Bliss-Leavitt 5-Meter, 21-inch, Mark I., complete in all parts, appurtenances, and spare parts; and to be constructed of material of domestic manufacture, and in all respects as described in the specifications last above mentioned, and to

deliver the said torpedoes F. O. B. Newport, Rhode Island, upon a day specified in the said contract.

Fourth. And complainant further says that in the said contract it was, amongst other things, specifically stipulated, covenanted and agreed:

"Nineteenth. * * * that the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations, or others, or for other governments than the party of the second part thereto; that the party of the first part will not exhibit such device or in any way describe it to or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the party of the first part will not exhibit the performance of any torpedo containing such device, either in shop or in service tests, to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawing, patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract: Provided furthermore, That no device or design shall be considered as coming within the provision

of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when the said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

Fifth. And your complainant further says, that afterwards, to wit: on the twelfth day of June, nineteen hundred and twelve, and other further and separate contract was made by and between the said E. W. Bliss Company, which was then and there a corporation doing business in the Borough of Brooklyn, State and Eastern

District of New York, as aforesaid, and the United States of America, the complainant herein, wherein and whereby the said E. W. Bliss Company agreed at its own risk and expense to manufacture 120 torpedoes complete in all respects in accordance with drawings, plans and specifications approved by the Chief of the Bureau of Ordnance and designated as Bliss-Leavitt, 5.2 Meter by 45-Centimeter, Mark VII., as appears by the first paragraph of the said contract, which reads as follows:

"First. The party of the first part will, at its own risk and expense, manufacture, in conformity with the aforesaid drawings, plans and specifications:

(a) 120 torpedoes, complete, with gyro and operating tools, exercise head and war head, together with one set ready tools for each two (2) torpedoes, at \$5,800 each	\$696,000
(b) 120 sets gyro spare parts, complete, at \$40 each	4,800
(c) 24 sets of supply box tools, including one set of taps and dies for all special screws, bolts, nuts, etc.	
5 Each set of supply box tools, and each set of taps and dies to be furnished with a stowage box, at \$250 each	6,000
(d) 24 sets of spare parts and washers in stowage box, at \$123 each	2,952
(e) 10 sets gyros, complete, including gyro frames and attached mechanisms, with box, spare parts and operating tools, at \$890	8,900
(f) 20 sets gyro pots (inner and outer gimbal rings, wheels and holder), at \$350 each	7,000
(g) 20 gyro adjusting stands, at \$250 each	5,000
Total	\$730,652

"One set each of Items (c) and (d) to accompany each lot of five torpedoes; the remainder required to complete the full number of sets contracted for shall be delivered with the last lot of torpedoes.

"One set of gyros, complete, with box spare parts, and operating tools, Item (e), to accompany each ten torpedoes delivered.

"One set of gyro pots (inner and outer gimbal rings, wheels and holder) to accompany each of the first twenty (20) lots of torpedoes delivered.

"One gyro adjusting stand, Item (g), to accompany each of the first twenty (20) lots of torpedoes delivered.

"Such torpedoes and accompanying appurtenances and spare parts to be constructed of material of domestic manufacture, and to be in all respects as described in the specifications; and will deliver the said torpedoes f. o. b. Newport, R. I., it being, however, expressly understood and agreed that if any article or thing included in or covered by the drawings, plans and specifications aforesaid, shall be found during the prosecution of the work under this contract to be not produced or manufactured in the United States, and if after reasonable effort it shall be found impracticable to ob-

tain the same as an article of domestic manufacture, then and in such case provision shall be made, by or with the approval of the Secretary of the Navy for such alterations in the drawings, plans and specifications, or for the adoption of such new or different device or plan as may be found necessary in order to carry out and complete this contract, subject as to increased or diminished compensation by reason of such change to the conditions applicable to changes as expressed in the second clause of this contract."

and agreed to deliver those same torpedoes upon a day in the said contract mentioned, which said contract, plans and specifications are on file in the Navy Department of the United States, copies thereof are in the possession of the complainant herein, and will be produced upon the trial of this action, which complainant prays may be considered as incorporated in the body of this complaint.

Sixth: And your complainant further says that the United States of America, by its properly duly authorized officer, accepted the said contracts, and the said E. W. Bliss Company, such corporation as aforesaid, entered into the manufacture of the said torpedoes and delivered the same to the complainant herein.

Seventh: Complainant further says that as appears by the second paragraph of the said last mentioned contract that:

"Second: The manufacture of said torpedoes (the word "torpedoes" as used throughout this contract being intended to include everything covered by the drawings, plans and specifications above referred to) shall conform in all respects to and with said
 7 drawings, plans and specifications, including duly authorized changes therein, but said drawings, plans and specifications, are not hereto annexed or made a part hereof. They contain information of a confidential character that cannot be made public without detriment to the government's and the contractors' interests, and they are to be treated as confidential by the parties of this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract. No omission in the drawings, plans or specifications of any detail, object or provision necessary to carry this contract into full and complete effect shall operate to the disadvantage of the party of the second part, but the same shall be satisfactorily supplied, performed and observed by the party of the first part, and all claims for extra compensation by reason of or for or on account of such extra performance are hereby, and, in consideration of the premises, expressly waived; and it is further provided that the provisions of this contract, and the drawings and specifications aforesaid, may be changed by the party of the second part. The cost of such changes shall be estimated by the naval inspector at the works of the party of the first part, and if less than five hundred dollars (\$500) shall be determined by him, subject to approval by the Chief of the Bureau of Ordnance. If the cost of such changes as estimated by said inspector be five hundred dollars (\$500) or more, the cost thereof shall be determined by a

board of not fewer than three naval officers, whose determination shall be subject to approval by the Secretary of the Navy. The determination of said inspector or of said board as to the amount of the increased or diminished compensation that the party of the first part shall be entitled to receive, if any, in consequence of such changes shall, when approved by the Chief of the Bureau of Ordnance or by the Secretary of the Navy as herein provided, be binding upon the party of the first part: Provided, That no such change shall be made when the cost thereof shall, in the execution of the work, exceed five hundred dollars (\$500) except upon the written order of the Secretary or the Assistant Secretary of the Navy." and complainant further says, that by Paragraph Twentieth of the said contract of June 12, 1912, it was, amongst other things, specifically stated, covenanted and agreed in the words and language in all respects the same as the covenants and agreements made in Paragraph Nineteenth hereinbefore mentioned of the first hereinbefore mentioned contract, to wit: the contract of November 22, 1905, to which said paragraph complainant begs leave to refer for the language of Paragraph Twentieth of said contract of June 12, 1912.

Eighth. Complainant further says, that the efficiency and value of the several torpedoes above mentioned is entirely due to the use therein of turbines revolving in opposite directions for the propulsion of the torpedo, to wit: the balanced turbine method of propulsion; and that this feature of torpedo construction was conceived in the Bureau of Ordnance and in the latter part of 1906 and in the early part of 1907, and that the defendant, the E. W. Bliss Company, was duly informed thereof under the protection of the clause quoted. United States patent therefor, No. 858,266, was granted by the United States to Lieutenant G. C. Davison, June 25, 1907, and is now owned by your complainant by assignment from the said patentee. That through its agents, officers and employees your complainant made the drawings and draughts and compiled the

specifications and plans for the installation of the turbines in the several torpedoes above mentioned and designed the plans for this purpose. That your complainant acting through the Navy Department of the United States, employed the said defendant company to manufacture the necessary materials for installing the turbines in the several torpedoes of the character and designation known in the several contracts above mentioned. That the complainant, the United States of America, by its Navy Department, and through the Bureau of Ordnance thereof, devised and designed modifications of the superheater; changes in the type of the afterbody; changes in the location and of the area of the vertical rudders; changes in the method of starting torpedoes; changes in the type of depth of engines; changes of the curve fire gyro and the independent spin principle, and specifically devised and designed ball bearings for gyro bearings, and compound regulation of air, each and all of which were parts of the torpedoes of the kind designated and known as the Bliss-Leavitt 5-Meter, 21-inch, Mark I. torpedoes, specified in the contract first above mentioned, and also in each and

all of the torpedoes designated and known as the Bliss-Leavitt, 5.2-Meter by 45 Centimeter, Mark VII., mentioned in the contract of June 12, 1912, being the second contract mentioned in the complaint herein.

Ninth. That each and all of the aforementioned devices and designs were furnished by the United States of America, the complainant herein, to the said E. W. Bliss Company, the defendant above mentioned, and that each of the devices and designs last above mentioned, at the time when the said devices and designs were conveyed to the party of the first part, it was stated by the party of the second

part to the party of the first part, by written communication, that the party of the second part considered that the said devices and designs were embraced within the provisions of Clause Nineteen of the said contract of November 22, 1905, or of Clause Twentieth of the said contract of June 12, 1912, as the case may be, and by that company accepted and received from the complainant herein, and incorporated by them in the manufacture in each of the several classes of torpedoes hereinbefore set forth. And your complainant further says, that notwithstanding the fact that the said devices and designs were furnished by the party of the second part as last above mentioned, to the party of the first part, the party of the first part, to the said contracts, to wit: the E. W. Bliss Company, the defendant above named, has entered into negotiations with and intends to make and sell torpedoes of the several classes hereinbefore mentioned to parties and governments other than the Government of the United States of America, and to dispose of torpedoes of the kind and character designated in the several contracts hereinbefore mentioned, to persons, copartnerships, corporations, and to foreign nations, and thereby to violate not only the terms of their said several contracts with the United States, as hereinbefore more specifically set forth, but also to willfully and without proper authority communicate and attempt to communicate to persons not entitled to receive the same, and to whom the same ought not, in the interests of the National defense, to be communicated with, documents, sketches, models, plans and knowledge to which they are not entitled, and which the defendants have no right to communicate, and thereby to violate the terms and conditions of the several contracts hereinbefore mentioned; to violate the laws of the United States of

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America, and the rules and regulations of its Navy Department applicable thereto.

Tenth. That on or about the ninth day of May, nineteen hundred and thirteen, the said defendant, the E. W. Bliss Company, by letter in writing gave notice to the complainant by means of a communication directed to the Honorable The Secretary of the Navy of the United States, and received by him, that it intended to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and to make a demonstration of the operation of the said torpedo to a representative of Messrs. Whitehead and Company on or immediately after June 1st, 1913.

Eleventh. That the said proposed action of the defendant, the E.

W. Bliss Company, is contrary to the contracts of the said defendant made with the complainant herein, and that if the said defendants are permitted to carry out their intention as above expressed the several contracts made by them with the complainant will be a violation not only of the contracts hereinbefore mentioned, made and entered into between the said defendant and this complainant, but also a violation of the laws of the United States of America and the regulations of the Navy Department made in conformity therewith.

Twelfth. That your complainant is informed and believes that unless restrained by this Honorable Court, the defendant will carry into effect the threat and expressed intention made by it in its letter to the complainant last above mentioned, and that thereby the United States of America will be greatly damaged in its good name and fame, and its contracts treated with contumely, and its laws held of no effect.

Thirteenth. That the various acts and things complained of are unlawful and contrary to equity and good conscience, and tend to the injury of your orator in the premises. That your orator is without remedy in the premises at law, and can have no adequate relief except in a court of equity where matters of this and like kindred nature are particularly cognizable and relievable. That the injury to the United States is not measurable in damages and is irreparable and cannot be compensated for by an action at law. That your complainant has no adequate relief in law, and the District Court of the United States for the Eastern District of New York has jurisdiction to require and enjoin the defendant to abstain from the illegal acts and things above mentioned.

In consideration, therefore, of the premises, and in order that the defendant may not carry out its expressed intention to violate the contracts hereinbefore specifically set forth, and to the end that the defendant may appear and answer all and singular the matters herein set forth and complained of, and particularly the defendant, the E. W. Bliss Company, may be restrained and enjoined from communicating the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and may be restrained and enjoined from making any demonstration of the operation of the said torpedo to a representative of Messrs. Whitehead and Company, or to any other person, government, or corporation, and that your orator may obtain such other and further relief as to this Court may seem just, or its equity require; and may it please your Honors to grant to your orator not only a writ of injunction conformable to the form of this bill, but also a writ or writs of subpoena directed to the defendant, the E. W. Bliss Company, and to all and each of said company's officers, servants, agents and employees, commanding them at a day certain personally to appear and be brought before this honorable court, then and there to answer unto this bill of complaint, and then and there to abide and perform such other order and decree in the premises as — this honorable court may

seem proper, and shall appear agreeable to equity and good conscience and form.

Dated, Brooklyn, N. Y., May 27th, 1913.

WILLIAM J. YOUNGS,

*United States Attorney for the Eastern District of
New York and Attorney for Complaint.*

Office & P. O. Address, 213 Federal Building, Brooklyn, N. Y.

Complaint filed May —, 1913.

Subpœna served May 28, 1913.

Complaint amended June 24, 1913 and — 1913.

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Answer as Amended.

United States District Court, Eastern District of New York.

In Equity.

UNITED STATES OF AMERICA

against

E. W. BLISS COMPANY.

The answer of the E. W. Bliss Company to the Bill of Complaint herein.

The defendant, saving and reserving all and all manner of benefit of advantage and exception that may be taken to the many errors, uncertainties and insufficiencies in the bill of complaint, for answer thereto, says:

First. The defendant admits the averments of paragraph "First" of the bill of complaint.

Second. The defendant admits that it is a corporation as averred in paragraph "Second" of the bill of complaint.

Third. The defendant admits that under date of November 22, 1905, a certain contract was entered into between the defendant and the complainant as averred in paragraph "Third" of the bill of complaint, saving that the recital thereof in the bill of complaint is insufficient and incomplete, and the defendant will invoke the entire contract and the drawings, plans and specifications referred to therein to be produced upon the trial of this action, of which profert is made in the said paragraph of the bill of complaint.

Fourth. The defendant admits that said contract of November 22, 1905, contains among other things a clause "Nineteenth" which is in part recited in paragraph "Fourth" of the bill of complaint.

15 Fifth. Defendant admits that under date of June 12, 1912, another contract was entered into between the defendant and the complainant as averred in paragraph "Fifth" of the bill of complaint, saying that the recital thereof in the bill of complaint is insufficient and incomplete, and the defendant will invoke the entire con-

tract and the drawings, plans and specifications referred to therein to be produced upon the trial of this action, of which profert is made in the said paragraph of the bill of complaint.

Sixth. The defendant admits the averments of the "Sixth" paragraph of the bill of complaint, except that with respect to said contract of June 12, 1912, the defendant avers that all of the torpedoes to be manufactured pursuant to said contract have not yet been delivered to the complainant.

Seventh. The defendant admits that in said contract of June 12, 1912, there is contained among other things a clause "Second" as recited in paragraph "Seventh" of the bill of complaint; and admits that in said contract there is contained also a clause "Twentieth" in words and language in all substantial respects the same as clause "Nineteenth" of the aforesaid contract of November 22, 1905.

Eighth. The defendant with respect to the averments of paragraph "Eighth" of the bill of complaint (1) denies that the efficiency and value of the several torpedoes referred to in said above mentioned contract is entirely due, or is due in a great measure, to the use therein of turbines revolving in opposite directions for the propulsion of the torpedo, to wit, the so-called balanced turbine method of propulsion; and (2) denies that this feature of torpedo

16 construction was conceived in the Bureau of Ordnance, and denies that in the latter part of 1906 and in the early part of 1907, said feature of torpedo construction was new, but on the contrary defendant avers that the same was known to and in the possession of and had been used by the defendant; and (3) the defendant denies that the defendant was duly informed thereof under the protection of the clause quoted in the bill of complaint (namely, clause Nineteenth of said contract of November 22, 1905). (4) The defendant admits that United States patent No. 858,266 was granted by the United States to Lieutenant G. C. Davison under date of June 25, 1907, and admits that said patent is now owned by the complainant by assignment from said patentee, and avers that at and prior to the grant of said patent the same was so owned by complainant, and that the same was so assigned to complainant under date of December 27, 1906, as appears by a duly certified copy of such assignment, which will be produced upon the trial of this action. (5) The defendant denies that the complainant, through its agents, officers or employees, made the drawings and drafts and compiled the specifications and plans for the installation of the turbines in the several torpedoes above mentioned and designed the plans for this purpose; but the defendant avers that the drawings, specifications and plans under which the turbines in the said torpedoes were constructed were made by the defendant. (6) The defendant admits that the complainant employed the defendant to manufacture the necessary materials for installing turbines in the several torpedoes of the character and designation known in the several contracts above mentioned. (7) The defendant denies that the complainant devised the turbines of the balanced type with turbines revolving in opposite directions which

are the active propelling force of all and several the torpedoes of the several classes mentioned in the first and second contracts referred to in the bill of complaint; but the defendant avers that such turbines as were incorporated in the torpedoes manufactured under said contracts were of the defendant's design. (8) The defendant admits that the complainant through the Bureau of Ordnance devised or designed and suggested a certain modification of the so-called super-heater in certain torpedoes manufactured by the defendant for the complainant under the aforesaid contract of November 22, 1905, but denies that said modification of the super-heater forms any part of the existing type of Bliss-Leavitt torpedoes which are the subject of said contract of June 12, 1912, and denies that the defendant has at any time threatened to or now intends to make use of or disclose any information concerning the same, but whether the same is one of the modifications of the superheater referred to the bill of complaint defendant has no knowledge. (9) The defendant is without knowledge that any other modifications of the superheater, or any changes in the type of the after-body of the torpedo, or in the location or area of the vertical rudders, or in the method of starting torpedoes, or in the type of depth engines, or in the curve fire gyro, or in the independent spin principle, or in ball bearings for the gyro bearings, or in the compound regulation of air, were ever devised or designed by the complainant or its officers, and denies that the same or any of them were communicated by the complainant or its officers to the defendant, or were embodied in torpedoes known as the Bliss-Leavitt torpedoes specified in either of the contracts hereinbefore mentioned.

And defendant is without knowledge of any of the other modifications or changes thus alleged in paragraph Eighth of the bill of complaint and prays to be further informed thereof.

Ninth. The defendant with respect to the averments of paragraph "Ninth" of the bill of complaint (1) denies that each and all of the aforementioned devices and designs (or any of them except so far as hereinbefore admitted) were furnished by the complainant to the defendant, and denies that at any time when any such devices and designs were conveyed by the complainant to the defendant it was stated by the complainant by written communication that the complainant considered that the said devices and designs were embraced within the provisions of clause "Nineteenth" of the said contract of November 22, 1905, or of clause "Twentieth" of the contract of June 12, 1912, as the case might be; and denies that each and all or any of such devices and designs were by the defendant accepted and received from the complainant, or were by the defendant incorporated in the manufacture of torpedoes under the contracts aforesaid. (2) The defendant admits that it has entered into negotiations with and intends to make and sell torpedoes known as Bliss-Leavitt torpedoes, to parties and governments other than the Government of the United States of America, being torpedoes of the type, kind or construction referred to in and which it is now manufacturing under said contract of June 12, 1912, but not torpedoes of the type, kind or construction referred to in and manufactured

under said contract of November 22, 1905, and that it intends to dispose of such torpedoes of said present type to persons or copartnerships or corporations or to foreign nations, and that it has a legal right so to do; and denies that thereby it will violate the terms of

19 either of the contracts aforesaid; and denies that it intends to or will communicate or attempt to communicate to persons not entitled to receive the same, and to whom the same ought not in the interest of the National defense to be communicated, any documents, sketches, models, plans or knowledge to which such persons are not entitled, and which the defendant has no right to communicate; and denies any purpose or intention to violate the terms and conditions of the several contracts mentioned in the bill of complaint, and denies any purpose or intention to violate any laws of the United States, or any lawful rules and regulations of the Navy Department of the United States applicable thereto.

Tenth. The defendant admits that on or about the 9th day of May, 1913, it gave notice to the complainant by a letter in writing of the general purport recited in paragraph "Tenth" of the bill of complaint, but avers that the recital thereof in said paragraph is incomplete, and refers the Court to said letter.

Eleventh. The defendant denies that its said proposed action as stated in said letter of May 9, 1913, is contrary to the contracts hereinbefore referred to, or a violation thereof, and denies that the same is a violation of any laws of the United States of America or of any lawful regulations of the Navy Department; and avers that its said proposed action is lawful and within the defendant's rights in the premises.

Twelfth. The defendant further answering avers (1) that the balancing of rotary bodies analogous to turbines by the rotation thereof in opposite directions at equal speeds and in such manner as to eliminate gyroscopic effects, was long prior to 1906 a matter of common knowledge, and that such knowledge was in the possession of the defendant; (2) that prior to the latter part
20 of 1906 and the early part of 1907 the use in torpedoes of turbines revolving in opposite directions for the propulsion of the torpedo, to wit: the balanced turbine method of propulsion, was known to the defendant, and such turbines had been invented or devised and designed by officers or employees of the defendant, and torpedoes containing the same had been tested and used by the defendant, and defendant was in full possession of all requisite knowledge and information concerning the same; (3) that prior to any communication to the defendant by the complainant, or any officers or employees thereof, of any device or design embodying such balanced turbine method of propulsion, the defendant had in its possession full and complete designs and drawings thereof and was engaged diligently in developing, constructing and experimenting therewith, and that defendant did construct torpedoes embodying the same, and did operate such torpedoes and in due course did communicate full plans and specifications thereof to the Bureau of Ordnance of the United States Navy; (4) that the torpedoes manufactured by the defendant and supplied to the complainant under the

contracts aforesaid, and other contracts hereinafter recited, when said torpedoes contained turbines revolving in opposite directions, were constructed not in accordance with any plans or designs furnished by the complainant or its officers to the defendant, but were constructed in accordance with designs made by the defendant; (5) and that in the existing type of Bliss-Leavitt torpedo "Mark VII" now in course of manufacture under said contract of June 12, 1912, the turbines revolving in opposite directions and their mounting, gearing and accessories, are of a design made and originated by the defendant, and widely different from any design at any time

21 communicated to the defendant by the complainant or its officers, and that said design in said existing type of Bliss-Leavitt torpedo is the property of defendant.

Thirteenth. The defendant further answering avers that after the grant and publication of said United States patent No. 858,266, granted June 25, 1907, to G. C. Davison, and in or about the month of August, 1907, the defendant purchased from said Davison his alleged invention purporting to be protected by said patent, and any rights he had or might have therefor for certain foreign countries, including the right to patent the same, and that pursuant thereto the defendant caused applications for patents therefor to be made in Great Britain, France and Japan, and that in due course said applications were granted and patents therefor were issued, namely:—

In Great Britain, patent No. 22,130, dated as of October 19, 1906;

In France patent No. 382,967, dated October 16, 1907;

In Japan, patent No. 18326, dated July 18, 1910;

and that said patents in France and Japan were issued and granted to the defendant as assignee of said Davison, and that said patent in Great Britain was granted to said Davison and by him assigned to the defendant under date of May 1, 1908; all as by reference to said several Letters Patent and the assignments thereof respectively to be produced in court at the trial of this action will more fully appear. And the defendant avers on information and belief that

22 said purchase by defendant from said Davison was with the knowledge and acquiescence of the complainant, and of the officers of the Bureau of Ordnance of the United States Navy.

Fourteenth. The defendant further answering avers that by virtue of said patents in Great Britain, France and Japan, the defendant holds and enjoys in said countries the same rights and property concerning said invention of said Davison, that the complainant holds and enjoys in this country by virtue of said United States patent 858,266; and that in all other foreign countries in which no patents were applied for or granted concerning said invention, the same is public property, being publicly known by the publication of said patents in the United States, Great Britain, France and Japan, and is in such other countries open and free to the adoption, manufacture, use and sale thereof by all persons, concerns and governments.

Fifteenth. The defendant further answering avers that intermediate of the two contracts recited in the bill of complaint, there were

entered into between the complainant and the defendant certain other contracts for the manufacture by defendant of torpedoes known as Bliss-Leavitt torpedoes for delivery to the Navy Department of the United States, which contracts bear respectively the following dates, namely:

April 20, 1909;
June 16, 1909;
October 22, 1909;
July 27, 1910;
December 24, 1910 (two contracts);
February 16, 1911 (two contracts);

and that each and all of said intervening contracts contained a clause "Nineteenth" identical word for word with the clause Nineteenth in said contract of November 22, 1905; and for the full

23 purpose of the contracts in other respects the defendant refers to said contracts, or to true copies thereof to be produced in court at the trial of this action. And the defendant avers, on information and belief, that each of said intervening contracts was entered into between complainant and the defendant with full knowledge by both parties of the grant and publication of said United States patent No. 858,266 whereby, on June 25, 1907, the said balanced turbine method of propulsion of torpedoes was made public, and with full knowledge by both parties that said balanced turbine method of propulsion of torpedoes had been patented in Great Britain, France and Japan as hereinabove stated, and with full knowledge on the part of complainant of the ownership of said foreign patents by defendant and of the claim by defendant of full right and authority to manufacture and sell torpedoes known as the Bliss-Leavitt torpedoes containing said balanced turbine in and for use in foreign countries, and without any notice by the complainant to the defendant of any claim by the complainant that said balanced turbine method of propulsion was considered by the complainant to be within the provisions of clause Nineteenth of said contract of 1905, or the like clause of any of said intervening contracts, and that thereby the complainant waived any claim or right which otherwise it might have had arising out of said contract of 1905.

Sixteenth. The defendant moves to dismiss so much of the bill of complaint herein (being contained in paragraph "Ninth" thereof) as avers that the defendant intends to willfully and without proper authority communicate and attempt to communicate to persons not entitled to receive the same and to whom the same ought not, in the
24 interests of the National defense be communicated, with documents, sketches, models, plans and knowledge to which they are not entitled and which the defendants have no right to communicate, and thereby to violate the laws of the United States of America and the rules and regulations of its Navy Department applicable thereto:—for the reason that it appears upon the face of the bill that such averments are insufficient to constitute a valid cause of action in equity.

And the defendant prays that same benefit of the facts and things herein set forth as if it had presented the same by motion in lieu of a

demurrer or plea where such would have been proper, and it submits that the complainant has no right to any other or further answer to said bill of complaint that is herein contained, and has no right to any injunction, decree or other relief prayed for in said bill; and the defendant prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

Dated, June 24, 1913.

E. W. BLISS COMPANY, *Defendant*.

ARTHUR C. FRASER, *Solicitor*.

No. 170 Broadway, Borough of Manhattan, New York City.

FRANK H. PLATT,

Of Counsel.

Answer filed June 17, 1913.

Amendment to Answer filed June 24, 1913.

25 *Complainants' Letter on Motion for Bill of Particulars.*

Department of Justice.

Office of the United States Attorney for the Eastern District of
New York.

BROOKLYN, N. Y., November 5, 1913.

W. J. Y./M. C. K.

522.

Mr. Arthur C. Fraser, 170 Broadway, New York City.

SIR: In accordance with our agreement, and in compliance with your request at the motion for a so-called bill of particulars which has just been argued before Judge Veeder, I beg leave to say, in your motion you desire the precise nature of the matters referred to in Paragraph Eighth of the Bill of Complaint, and therein designated as follows:

(a) Modification of the superheater:

This expression refers to the numerous changes and modifications of the so-called Leavitt super-heating system from the time of its first inception as an inside superheater to the present type of water heater as installed in the Mark VII and Mark VIII torpedoes.

As to this a letter of the Bureau numbered 21715-2 of March 15, 1908, with the endorsement of September 21, 1906, directs that a certain design, a blue print of which was furnished, be fitted to the 250 Bliss-Leavitt 5 m x 21" Mark I torpedoes under the provisions of Clause 19 of that contract.

The bureau in its letter 21715/2 of March 15, 1908, forwarded a description with blue print, complete, showing the principle and operation of the so-called Gesztezy superheating system in which water was introduced for the formation of steam,

and this letter we propose to introduce in evidence. An indorsement of April 4, 1908, signed by F. C. B. Page, Vice President of the Bliss Company, returns the same to the Inspector of Ordnance. This letter and the endorsement were again returned to the E. W. Bliss Company, and on June 9, 1908, the endorsement was returned to the Bureau signed by Mr. Leavitt. These letters and endorsements relate to the modification of the superheater and we propose to introduce them all in evidence.

(b) Changes in type of afterbody:

This refers to the general discussion of the proper form, size and shape of the afterbody of the torpedo under the first contract for 300 torpedoes. When the question of size of torpedoes for battleships was first considered, the Washington Navy Yard and Torpedo Station were directed to conduct experiments to ascertain the proper size of afterbody. These experiments were conducted by Government officials and given to the Bliss Company and received and accepted by them, although complainant's counsel are not now advised of any particular communication by which the result of these experiments were placed under the secrecy clause of the contracts. Details of evidence as to this subject will be offered at the trial.

(c) Changes in location and area of vertical rudders:

This refers to the general discussion and experiments leading up to the determination of the proper area and position of vertical rudders for torpedoes, which experiments were carried on in connection

27. with the experiments referred to above for the determination of the size and form of afterbody. The letter of the Bureau dated October 18, 1905, numbered 17761/41, forwarded to E. W. Bliss Company the expert opinion of Naval Constructor D. W. Taylor as to the proper area of vertical rudders in connection with the form of afterbody to be used with the Bliss-Leavitt torpedoes. Bureau's file number 17761/28. The Bliss Company submitted a design of tail with rudders abaft propellers. File No. 17761/87, dated December 18, 1905, report from the Torpedo Station of certain experiments in connection with the location and area of rudders. This information was freely communicated to the Bliss Company, though complainant's counsel is not now advised of any particular instance in which said information was placed under the secrecy clauses of the contract. Details of evidence as to this subject will be offered at the trial.

(d) Changes in method of starting torpedoes:

As far as the records show, the action of the Bureau in regard to this subject was confined to the pointing out that the proposed method of starting torpedoes by the action of the impulse pressure on the diaphragm, was not applicable to torpedoes to be used in submerged tubes, since the hydrostatic pressure would cause them to start. The modification of the Bureau's specifications required a method of starting which is practically that now used, the cutting of a starting nipple under air pressure and thereby releasing the mechanism of the torpedo. This starting nipple was pierced by the action of the starting lever of the torpedo when thrown back by the tripping latch of the tube.

Information as to this feature was freely furnished to the Bliss Company and adopted by them, although complainant's counsel is not now advised of any particular communication in which said information was placed under the secrecy clauses of the contract. Details of evidence as to this subject will be offered at the trial.

(e) Changes in type of depth engine:

This refers to the numerous modifications and changes of the depth engine as proposed by the E. W. Bliss Company and included the modifications and changes requested and required by the Bureau up to the present type now used in the Mark VII torpedo. The E. W. Bliss Company at one stage of development, in 1906, had installed in a torpedo a mechanical depth engine, which on account of defects found in experiments, was abandoned and an air engine installed. The air engine as at first installed was wholly a Bliss design but did not give satisfaction. Bureau of Ordnance File No. 15157/202. The Torpedo Station calls attention to these defects and asks authority to install an improved engine in accordance with drawing No. 25082, which authority was granted. Previous to this the steering engines furnished by the E. W. Bliss Company with Mark II torpedoes were found to deteriorate in service, and the Bureau directed the torpedo Station to design and had issued to the service the modified steering engine shown on Ordnance drawing No. 36394. There was considerable dissatisfaction found with this type of steering engine installed in the last consignment of Mark IV 18" and certain consignments of Mark III 21" torpedoes, and this subject was taken up by the Torpedo Board which met at the Works of the E. W. Bliss Company on March 21, 1910. The entire subject was discussed with representative of the Bliss Company, Mr. Leavitt, in order to eliminate defects pointed out in the then present design and in the modified design proposed by the E. W. Bliss Company. Mr. Leavitt at that time was shown designs of the Whitehead engine and this engine was discussed with him by Commanders Bristol and Norton and Lieutenants McCrary and Tomb. Mr. Leavitt replied that he would and later presented the Board a sketch for its consideration. This sketch was considered and other points suggested were considered, and Mr. Leavitt was requested to submit a new design for the Board's consideration. The present depth engine as now installed was practically the Weymouth depth engine as modified and changed after consultation of Mr. Leavitt with the Members of the Torpedo Board above mentioned.

Information as to this feature was freely furnished to the Bliss Company and adopted by them, although complainant's counsel is not now advised of any particular communication in which said information was placed under the secrecy clause of the contract. Details of evidence as to this subject will be offered at the trial.

(f) Changes in curved fire gyro:

This refers to the method and principle incorporated in all gyros built by the Bliss Company by which a torpedo may be caused to take up a predetermined course within certain defined limits no

matter what the direction of launching may be, and which is necessary for submerged fire from battleships where the launching tube is a fixture. Under date of February 18, 1899, Lieut. W. I. Chambers submitted to the Bureau of Ordnance a gyro gear in which was incorporated means for providing for the so-called curved fire by revolutions of the valve plug. This is a completed gear and is now at the Torpedo Station. The incorporation of the curved fire principle was demanded by the Bureau in direct opposition to the wishes of the Bliss Company in all torpedoes under contract except the 100 Mark VI torpedoes on Contract No. 349 of October 22, 1909.

Information as to this feature was freely furnished to the Bliss Company and adopted by them, although complainant's counsel is not now advised of any particular communication in which said information was placed under the secrecy clause of the contract. Details of evidence as to this subject will be offered at the trial.

(g) Changes in independent spin:

This refers to the method or principle of spinning the gyro independently. The original Bliss gyro was a mechanical one in which it was necessary for the engines of the torpedo to be turned before the impulse to the gyro could even be started. This necessarily results in very late unlocking. The adoption of the air impulse greatly reduced this interval. The Bureau's records show that the principle of independent air spun gyro was first conceived as early as 1890 and that gyros were completed, built and tested containing this principle, and that knowledge regarding this gyro was freely communicated to the representatives of the Bliss Company during their conferences with representatives of the Bureau.

Information as to this feature was freely furnished to the Bliss Company and adopted by them, although complainant's counsel is not now advised of any particular communication in which said information was placed under the secrecy clauses of the contract. Details of evidence as to this subject will be offered at the trial.

As to (h) ball bearings for gyro bearings and (i) compound regulation of air, and as to the balanced turbine method or principle or propulsion, you have been previously advised as to dates

when specific notice of secrecy was given with respect to these features. The item (h) ball bearings for gyro bearings, and the item balanced turbine principle or method of propulsion were placed under secrecy clause 19 of the 1905 contract, by written communication from the complainant to the defendant. Item (i) compound regulations of air, was placed under secrecy clause 20 of the 1912 contract by a written communication from the complainant to the defendant. The dates of these letters and copies thereof have already been furnished you.

Respectfully,

WM. J. YOUNG,
U. S. Attorney.

(Filed, Nov. 10, 1913.)

Testimony.

United States District Court. Eastern District of New York.

Before Hon. Van Vechten Veeder, U. S. D. J.

The United States
against
E. W. Bliss & Company.

BROOKLYN, November 10, 1913.

Appearances:

Malcolm A. Coles, Esq., Special Asst. Attorney General;
William J. Youngs, Esq., U. S. District Attorney;
Lewis R. Bick, Esq., for the Government;
Arthur C. Fraser, Esq., Frank H. Platt, Esq., for the Defendant.

Mr. Fraser: The letter from the United States attorney, which was written pursuant to the motion for a bill of particulars, I understand may be received as a statement, so far as it goes, of the Government's case and by way of amplification of the Bill, but without limiting it.

The Court: Yes, but the only conclusiveness in respect to a bill of particulars is the usual cause, limiting the case to the particulars specified. I have not, and I am not going to do that in this case; for I am going to hold the Government to
33 the case on the line of its opening.

(The letter is placed on file.)

The Court: (To Complainant's Counsel.) Anything filed, anything given by the Government to the defendant in amplification of this case is an explanation of what the case is to the same extent that your opening statement is; you would be bound to the same extent by it, as far as it goes; anything that you supplied to the defendant company, together with your opening statement, will be the case to be tried.

Complainant's Opening.

Mr. Coles: If the Court please, this controversy or this suit is an action brought by the Government to restrain the E. W. Bliss Company from exhibiting, demonstrating, or otherwise revealing to representatives of any foreign government of any other person than the United States, the completed mechanism, embodied in the present type of Bliss-Leavitt torpedo.

The relation between the Government and the Bliss Company has been a contractual one for a number of years. There are a series of contracts entered into between the Navy Department and the Bliss Company relating to the construction of various devices of torpedo. It is not necessary to go back to the beginning of that contractual

period, but, for the purpose of this case, it is sufficient to say that prior to some time in 1902, the type of motors for driving
34 torpedoes which were constructed under the contracts between the Bliss Company and the United States, was of the reciprocating engine type. From that type an advance was made to what is known as the unbalanced turbine type of motor, and that unbalanced turbine type was embraced in a number of contracts covering the period from 1902 up to the time when the type was changed to what is known as the balanced turbine type.

One of the contracts which figure in this case is the contract of November 22, 1905. Under that contract, which was for 300 torpedoes of the Mark 1 or 21-inch, 50 of the 300 were delivered by the Bliss Company, but out of that fifty, ten were accepted for experimental purposes only, and the others were the subject of further negotiations with reference to meeting the specifications and the requirements of the contract, and with reference to being accepted to meet the requirements for a less distance range.

Prior to the 1905 contract there had been no questions as to any secrecy clause in the contracts between the Bliss Company and the Government, and the relations between the naval experts and the Bliss Company experts had been one of free intercourse in expressing and exchanging their ideas as to improvements in the structures.

During the year 1906, a type of balanced turbine motor, operating torpedoes, was developed by officers of the Government, through the efforts of the Bureau at the torpedo station; and when that torpedo
35 had reached a stage which showed that it was efficient in overcoming the difficulties which had been experienced in the use of the unbalanced type, the Navy Department realized that it was then reaching a point where it should attempt to preserve secrecy as to the designs which had been originated by its experts and officers.

So that in the Fall of 1906, about November the 9th, 1906, the Bureau of Ordnance advised the E. W. Bliss Company that it had, by experiments, obtained a design of motor or engine for operating torpedoes, which it was believed would correct many of the difficulties experienced in the use of the unbalanced type and which would enable the Bliss Company to meet contract requirements as to distance or range.

The Bliss Company repeatedly requested the Government to reduce the requirements of the specifications, stating that they were unable to accomplish the range or distance required by the specifications, and the Bureau had repeatedly replied that it did not desire to reduce the contract requirements as to range until every effort had been exhausted to obtain the performance of the contract up to the range required in the specification.

In this communication of November 9, 1906, the Bureau advised the Bliss Company that it believed that with the use of this device which the Department had developed, that the contract requirements could be met, or words to that effect, and it notified them in advance at that time that when the design was furnished to them it would

36 be expected that they would consider it, as the Bureau considered it, to fall within the secrecy clause 19 of the contract of November 22, 1905.

That letter did not communicate any detailed plans, but merely advised them in advance that the Bureau had the design and that it was going to send it to them and when they received it it would be understood that it fell within the secrecy clause of the contract, so that they had a preliminary notice, if any such notice could possibly be contended to have been required.

Now the secrecy clause of the contract, according to the Government view, did not require any preliminary notice, so that as to the balanced turbine element, we expect to show even more than we think the contract requires to be shown.

Under the secrecy clause of the contract the Bureau of Ordnance communicated to the Bliss Company on January the 9th, 1907, the design of the balanced turbine which had been developed by the Government at Washington at the Navy Yard at the torpedo station, and with the assistance of the officers of the Navy.

That design was embodied in a blue print which will be known in this case as 117-E. That blue print had come to the Bureau of Ordnance from the torpedo station with a letter of January station with a letter of January 2nd, 1907, and the Bureau had forwarded that torpedo station letter to the Bliss Company by its endorsement January 9, 1907, and with that communication from the Bureau to the Bliss Company, of January 9, 1907, one of the two copies of the blue print 117-E was enclosed.

37 We will show that that communication in writing from the Bureau to the Bliss Company, of January the 9th, 1907, was received according to the custom, and in due course of business by the Inspector of Ordnance at the works of the E. W. Bliss Company, and by him delivered to the E. W. Bliss Company, and the enclosure blue print 117-E also delivered to the E. W. Bliss Company with said communication, at the same time.

At the hearing on the order to show cause my recollection is that the defendant did not admit that they had received the communication of January the 9th, 1907, notifying the defendant company that the Bureau expected it to observe secrecy with reference to the balanced turbine design which was at that time sent.

We expect to show that the requirements of the contract of November 2nd, 1905, which embodied the first secrecy clause, have been in all respects met in reference to the communications in writing by the plaintiff to the defendant, transmitting the design as to the element of the balanced turbine motor for torpedoes.

* * * * *

There are a number of other items in the Bill which I will now briefly run over.

The item: "Changes in type of after body."

As to this item we expect to show that designs or data of assistants in perfecting to the present stage the construction of this element were communicated by the complainant to the defendant. We con-

38 tend that whether the Court may find that these communications have met in all respects the provisions of the clauses 19 and 20 of the respective 1905 and 1912 contracts, is inconclusive, because outside of the contracts themselves, we contend that the information given was of a secret nature and of such importance to the arm of this nation's defence, to wit, the navy, that the preservation of secrecy with respect to it and them comes within the provision of the National Defence Act of March the 3rd, 1911 (26 Stats. L. 1084, 1085).

* * * * *

Mr. Coles: We claim that if the Court should rule that the acts of the complainant in communicating the information to the defendant may not come under the provisions of the contract, that nevertheless the complainant is entitled to restrain the defendant from disclosing the information communicated, because it is of such a secret and important nature in connection with the national defence as to be covered by the scope and the spirit of the National Defence Act.

* * * * *

Mr. Coles: To make it clear to your Honor I will review at this point, and state that we expect to be able to show that the provisions of the contract, clauses 19 and 20, have been complied with by the acts of the complainant in communicating with the defendant in respect to the following items in the Bill: the b-lanced turbine, the ball bearings for the gyro bearings, the compound double regulation of air, the modifications in the super-heater.

39 That as to the other items in the Bill, the information communicated by the complainant to the defendant was not always done literally in accordance with the terms of clauses 19 and 20 of the contract, in that it was not always in writing and at the time that the information was communicated.

Notwithstanding this, however, the Government claims that all of the items alleged in the Bill, both those items which may be found by the Court to be covered by the clauses 19 and 20 of the respective contracts, as well as those items in the Bill with respect to which the Court might consider had not fallen within the provisions of clauses 19 and 20 of the contracts, the Government contends that all of the items are within the provisions of the Act of March the 3rd, 1911, and that this Court has jurisdiction, this case having been brought before it in the manner and form here, to restrain at this time the commission of any of the prohibited acts set forth in said statute of March the 3rd, 1911.

Furthermore, the Government contends that there is another law of the United States which has a controlling force in this case, and that is the patent statutes of the United States; that in respect to the element in the Bill of the balanced turbine, the United States patent to Davison No. 858266, of June 25, 1907, application for which was filed October 9, 1906, is owned and controlled by the United States; that this patent belongs to the complainant, and that the defendant

40 has no right to do anything whatsoever under it, except as permitted by the complainant, the owner thereof; that the most that can be urged by the defendant with respect to this United States patent, is that the Government has permitted them to manufacture the structure disclosed therein for the sole purpose of delivering the same, when manufactured, to the Navy Department of the United States.

We contend that the defendant has no other rights whatsoever under this patent; that when it attempts to make or use or sell the structure covered by this patent, for any purpose whatsoever other than to deliver to the United States for use by the United States, it has exceeded any license or authority which it has obtained from the Government with respect to the use of the patent, and that this Court has ample jurisdiction in this action to restrain the infringement of the patent rights of the United States by the threatened action of the defendant.

[N. B. Per stipulation of counsel certain portions of the opening statement of Mr. Coles are omitted from this record.]

It is stipulated that in this opening statement no mention was made of the Government's bill being founded upon any theory of public policy.

WILLIAM J. YOUNGS,
Solicitor for Complainant,
ARTHUR C. FRASER,
Solicitor for Defendant.]

41 Mr. Youngs: If the Court please, we offer for identification Folios A, B, C, D, E and F, being certified copies, so far as the District Attorney's office has been able to procure them, of all letters and communications relating to the various portions of the torpedo in question, which are in possession of the Navy Department of the United States.

Mr. Coles: I offer in evidence certified copy of the contract of November 22, 1905.

It is marked Exhibit 1.

Mr. Coles: I offer in evidence certified copy of the contract of June 12, 1912.

It is marked Exhibit 2.

Mr. Youngs: I now offer in evidence a certified copy of a contract made and entered into between the Government of the United States and the defendant corporation, dated the 16th day of June, 1909.

Objected to. Objection sustained.

Mr. Young: We except.

The paper is marked Exhibit G for identification.

Mr. Coles: I offer in evidence a certified copy of the United States patent to Gregory C. Davison, No. 858266, granted June 26, 1907.

It is marked Exhibit 3.

Mr. Coles: I also offer in evidence a certified copy of an assign-

ment from the said Gregory C. Davison to the Secretary of the Navy of the application for said United States patent 858266.

Mr. Fraser: Defendant's counsel asks complainant's counsel whether this assignment is understood to have conveyed title to the United States.

42 Mr. Coles: That is the idea, yes.

The assignment is marked Exhibit 4.

Mr. Coles: I offer in evidence certified copy of letter from the Bliss Company to the Bureau of Ordnance, dated May 9, 1913, which appears at page 64 of Folio F.

It is marked Exhibit 5.

Mr. Coles: I also offer in evidence letter dated February 18th, 1913, from the Secretary of the Navy to the Bliss Company, which will be found at page 63 of Folio F.

Objected to as incompetent, irrelevant and immaterial.

The Court: I will take it.

Exception.

It is marked Exhibit 6.

Mr. Coles: I also offer in evidence a certified copy of a letter from the Bliss Company to the Bureau, dated February 10, 1913, pages 61 and 62 of Folio F.

It is marked Exhibit 7.

Mr. Coles: I offer in evidence a certified copy of a letter of December 30, 1912, from the Bliss Company to the Bureau, appearing at page 56 of Folio F.

Objected to as incompetent, irrelevant and immaterial.

The Court: To such of these as objection is made to on that score, I will take them subject to the objection, and when we get them all in I will rule.

The letter is marked Exhibit 8.

Mr. Coles: I offer in evidence a certified copy of a letter of December 19, 1912, from the Bliss Company to the Bureau, being found at page 50 of Folio F.

43 Same objection and ruling.

The letter is marked Exhibit 9.

Mr. Coles: I offer in evidence a certified copy of letter of December 13, 1912, from the Bureau to the Bliss Company, which appears at pages 42-44 of Folio F.

Same objection and ruling.

The letter is marked Exhibit 10.

Mr. Coles: I offer in evidence a certified copy of letter dated December 10, 1912, from the Bliss Company to the Bureau, appearing at pages 38-40 of Folio F.

Same objection and ruling.

The letter is marked Exhibit 11.

Mr. Coles: I offer in evidence a certified copy of a letter of April 24, 1911, from the Bureau to the Bliss Company, which appears at page 43 of Folio F.

Same objection and ruling.

It is marked Exhibit 12.

Mr. Coles: I offer in evidence a certified copy of letter of April 5,

1911, from the Bliss Company to the Bureau, appearing at pages 31-32 of Folio F.

Same objection and ruling.

The letter is marked Exhibit 13.

Mr. Coles: I offer in evidence a certified copy of a letter of April 3, 1911, from the Bureau to the Bliss Company, which appears at page 30 of Folio F.

Same objection and ruling.

The letter is marked Exhibit 14.

Mr. Coles: I offer in evidence a certified copy of a letter dated October 31, 1905, from the Bliss Company to the Bureau, which appears on page 24, Folio F.

The letter is marked Exhibit 15.

44 Mr. Coles: I offer in evidence a certified copy of a letter dated October 28, 1905, from the Bureau to the Bliss Company, which appears at pages 22 and 23 of Folio F.

The letter is marked Exhibit 16.

Mr. Coles: I offer in evidence certified copy of a letter dated October 27, 1905, from the Bliss Company to the Bureau, which appears at page 21 of Folio F.

The letter is marked Exhibit 17.

Mr. Coles: I offer in evidence certified copy of a letter dated October 25, 1905, from the Bureau to the Bliss Company, appearing at pages 18-20, Folio F.

The letter and enclosure are marked Exhibit 18.

Mr. Coles: I offer in evidence certified copy of a letter dated October 21, 1905, from the Bureau to the Bliss Company, which appears at page 17, Folio F.

The letter is marked Exhibit 19.

Mr. Coles: I offer in evidence certified copy of a letter dated October 19, 1905, from the Bliss Company to the Bureau, which appears at page 16, Folio F.

The letter is marked Exhibit 20.

Mr. Coles: I offer in evidence certified copy of a letter dated October 16, 1905, from the Bureau to the Bliss Company, appearing on pages 11 and 12, Folio F.

The letter is marked Exhibit 21.

Mr. Coles: I offer in evidence certified copy of a letter dated May 28, 1904, from the Bureau to the Bliss Company, pages 9 and 10 of Folio F.

Mr. Fraser: Objected to as irrelevant and immaterial.

Taken subject to the ruling as to the other letters.

45 The letter is marked Exhibit 22.

Mr. Coles: I offer in evidence certified copy of letter of April 28th, 1904, from the Bureau to the Bliss Company, appearing at page 8 of Folio F.

Mr. Fraser: Objected to as incompetent, irrelevant and immaterial. We don't know that we ever received this letter.

The Court: You will have ample opportunity to look the letters all over. It may be received subject to motion.

The letter is marked Exhibit 23.

Mr. Coles: I offer in evidence certified copy of a letter dated April 21, 1904, from the Bliss Company to the Bureau, which appears at pages 6 and 7, Folio F.

The letter is marked Exhibit 24.

Mr. Coles: I offer in evidence certified copy of a letter dated November 7, 1903, from the Bureau to the Bliss Company, on page 5 of Folio F.

The letter is marked Exhibit 25.

Mr. Coles: I offer in evidence certified copy of letter dated November 4, 1903, from the Bliss Company to the Bureau, pages 1 and 2 of Folio F.

The letter is marked Exhibit 26.

Mr. Coles: I now desire to offer for identification the physical embodiment of the torpedo of the present type, Mark 7, which represents the after body, and with the elements that are located and arranged therein.

The torpedo is marked Exhibit 27 for Identification.

46 BENJAMIN B. McCORMICK, called on behalf of the plaintiff, and being duly sworn, testifies:

By Mr. Coles:

Q. Please state your name, residence and occupation.

A. McCormick, Benjamin B.; residence 24 East 35th Street, New York City; occupation, naval officer.

Q. What is your present rank in the navy?

A. Commander of the United States Navy, retired.

Q. How long have you been in the naval service?

A. I entered in May, 1888.

Q. Where were you stationed on duty during the years, 1906 and 1907?

A. At the works of the E. W. Bliss Company, Adams & Plymouth Streets, Brooklyn, from about January, 1905, to February, 1908.

Q. What were your duties during that period?

A. I was stationed on duty as Inspector of Ordnance of the works of E. W. Bliss Company.

Q. What did you do in the way of performing your duties as Inspector of Ordnance?

A. The duty of Inspector of Ordnance was to follow up government contracts and report from completion and certify bills relating to the performance of the contracts.

Q. Did you, in performance of your duties as Inspector of Ordnance in connection with the Bliss Company, transmit to said company communications from the Bureau of Ordnance directed to the Bliss Company.

A. The Inspector of Ordnance was the authorized channel by which communications were forwarded from the Bureau of Ordnance to the Bliss Company.

Q. Was that the regular custom during the period of yours
47 with the E. W. Bliss Company, as Inspector of Ordnance.

A. That was the regular custom.

Q. I now call your attention to a communication from the Bureau to the Bliss Company, dated January 9, 1907, which appears on page 107 of folio B, marked for identification. Do you recall the receipt of that communication at your office from the Bureau of Ordnance?

A. I recall the receipt of this communication.

Q. Where did you receive that communication?

A. This communication was received through the mail in my office, at the Works of the E. W. Bliss Company.

Q. Was there anything which accompanied this communication?

A. The letter shows one inclosure, a blue print, No. 117 E, showing the gears for balanced turbine.

Q. I now hand you a blue print which you will please examine and state whether it is the blue print, 117 E?

A. This blue print is marked 117 Case E.

Q. I now hand you a copy of blue print 117 E, which was handed to the court by defendant's counsel, Mr. Arthur C. Fraser, on the argument of the motion to show cause in this case. Please examine this blue print and state whether it is identical in all respects with the copy of the blue print 117 E, previously called to your attention.

A. The blue prints appear to be identical.

Mr. Coles: I now offer in evidence the blue print, 117 E, which is the blue print referred to in my last question as having been handed to the court by defendant's counsel on motion to show cause.

The Court: It is already marked Exhibit 28.

Q. Please examine the blue print, Exhibit 28, and see 48 if there appears on the back of it any stamp, and if so, what is it?

A. The stamp on the back of this blue print is the stamp used in the office of the Inspector of Ordnance of the Works of E. W. Bliss Company, dated January 4, 1907, and marked 20361-3.

Q. Will you examine that stamp again and read what the stamped letters state?

A. The stamped letters read: "Enclosure 2, Bureau of Ordnance, January 4, 1907."

Q. Are there any numbers appearing in connection with that stamp?

A. The number previously given, 2036-3.

Q. Will you compare those numbers with the numbers on the communication from the Bureau of Ordnance to the Bliss Company, dated January 9, 1907, to which your attention was called?

A. The identification number on the stamp is the same as the number of the letter, the endorsement on the letter of the Bureau of Ordnance, dated January 9, 1907, showing that this blue print accompanied that letter.

Q. Is that Exhibit 28 the blue print you received with that letter?

A. This blue print is the same exhibit received with the letter.

Q. Please compare the paper which I now hand you with the

Page 107, Folio B, marked for identification, and state what the paper is.

Mr. Platt: That is objected to; the paper speaks for itself.

Mr. Coles: I now offer in evidence the original letter of the Bureau of Ordnance to the Bliss Company, dated January 9, 1907, with the endorsements and the stamp marks thereon.

Mr. Platt: If Your Honor please, there is a letter dated 49 January 2, 1907, signed by Commander Gleaves and addressed to the Chief of the Bureau of Ordnance, Navy Department, and as I understand it, Mr. McCormick says that letter reached him, but attached are three papers, dated January 9, 10, and 21, and a flimsy copy. There is nothing to show that any of these came to the attention of the Bliss Company; we object to these other papers as not being proved and there is no foundation laid for their admission.

Q. Do you recall the receipt of this communication of January 9, 1907, from the Bureau to the Bliss Company?

A. I do.

Q. Do you recall the receipt of the inclosure, of the blue print 117 E, with the letter?

A. I recall the receipt of the inclosure, the blue print, with the letter, yes.

Q. What disposition did you make of that communication from the Bureau of Ordnance and its inclosure?

A. I forwarded it.

Mr. Platt: That question calls for a conclusion. Let him say what he did with it.

The Court: Yes.

Q. What did you do with that communication of January 9, 1907, and its inclosure?

A. I delivered it.

Q. Who did you deliver it to? Will you examine the paper and see if it bears any indication as to whom you delivered it?

A. The letter of January 2nd bears the first endorsement, dated January 9th.

Q. What was the customary mode of official correspondence in use at that time by the Bureau in transmitting communications from the Bureau to the Bliss Company?

50 Mr. Platt: I object to that as irrelevant, incompetent and immaterial.

The Court: The objection is sustained. You may go on and describe the procedure.

By the Court:

Q. To whom did you deliver it, the elevator boy?

A. I delivered it by the regular method of delivery of papers.

Q. If you don't know, say so; if you do know, I want the name of the person to whom you delivered it.

A. It was not delivered by me; it was signed and forwarded by me to the officers of the company.

Q. How?

A. The papers were collected from my desk and carried to the desks of the officers of the company.

Q. You collected the papers and gave them to somebody else, did you? You didn't take them yourself?

A. No, I did not. They were signed on my desk and there collected by the regular authorized man of the company.

Mr. Platt: I move that be stricken out.

Q. We want to know the name of the person to whom they were delivered; you spoke of the elevator boy.

A. The authorized means of transmitting all letters was to send them up and down the elevator from one floor to another. I was two floors above the officers of the company. They were naturally carried by the elevator boy. The office man of my office would deliver them to the elevator boy.

Q. Who was the office man of your office, what was his name?

A. O'Brien, Moses J. O'Brien.

Q. You didn't deliver them yourself?

A. No.

Mr. Platt: I move that this testimony be stricken out, what has been said about the authorized method, as a conclusion.

51 The Court: It is stricken out.

Mr. Youngs: Your Honor will give us an exception.

The Court: The witness is asked for questions of fact and answers by conclusions; therefore it is stricken out.

By Mr. Coles:

Q. Does that original communication of January 9, 1907, bear any stamp of the E. W. Bliss Company?

A. The letter of Jan. 2, 1907 bears the stamp of the E. W. Bliss Company, the receiving stamp; the endorsement of January 9, 1907, does not bear the stamp of the company. The endorsement of January 10th, or my personal endorsement, forwarding this entire communication, with the blue print, bears the stamp as having been received.

Mr. Coles: I now offer in evidence the letter and the endorsements accompanying it.

The papers are received in evidence subject to a motion to strike out, and are marked Exhibit 29.

Q. State to the court whether first endorsement which is attached to the original paper was on the letter of January 2nd when you received it from the Bureau? I refer to the first endorsement of January 9, 1907.

Mr. Platt: I object.

The Court: I will allow the witness to testify if he can.

By the Court:

Q. You are asked now whether this original endorsement of January 9th was attached to this letter of January 2nd, at that time?

A. The endorsement of January 9th, marked the first endorsement, was attached to the letter of January 2nd, when I received it with the blue print.

Q. You didn't deliver them to the Bliss Company yourself?

A. I did not.

Q. You state you delivered them to somebody else for transmission.

A. They were transmitted through the regular channels.

Q. To whom did you deliver them, your office man, elevator boy or whom?

A. I delivered them to my office man.

Q. And that was Mr. O'Brien?

A. Yes.

By Mr. Coles:

Q. Now examine that original paper and state when you received it back in your office, and how you can tell that you did receive it back in the office.

A. I transferred these papers, including——

By the Court:

Q. That is not the question. Where did you get it and who gave it to you?

Q. Did you get it through the mail?

A. No, it was delivered by a messenger from the office of the company.

Q. Was it delivered to you?

A. No, I found it on my desk.

By Mr. Coles:

Q. When you found it on your desk was there any stamp showing that it had been in the possession of the Bliss Company?

Mr. Platt: That is objected to as calling for a conclusion.

By the Court:

Q. Did it have on it anything in addition to what it had when it left your hands before?

A. In addition, there were two stamps of the Bliss Company, one on the original letter of January 2, 1907, a second receiving stamp of the Bliss Company on my endorsement of January 10th, forwarding the original letter with the Bureau of Ordnance endorsement of January 9, 1907, with the blue print.

Mr. Platt: That is objected to.

The Court: I only take the fact that it had on it these endorsements when he found it on his desk.

By Mr. Coles:

Q. Please state to the court whether at the time that paper left your office it had on it the endorsement of the Bureau of Ordnance, dated January 9, 1907.

Q. Was that original paper, dated January 9, 1907, attached to the letter of January 2, 1907, when it left your desk and when it returned to your desk?

A. It was.

Q. In both instances?

A. In both instances.

Q. What did you do with the blue print 117 E, which you have stated was sent to your office from the bureau of ordnance by the communication of the Bureau dated January 2, 1907.

A. The blue print was received by me for the use of the E. W. Bliss Company and it accompanied the letter of January 2nd, with the endorsement of January 9th, with my transmitting endorsement of January 10th, to the company.

Q. When you received to wit: the letter of January 2, 1907, and the first endorsement of the Bureau, dated January 9, 1907, and your endorsement back on your desk, was the blue print 117 E with them?

A. The blue print 117 E was not with them.

54 Q. What did you do with those papers, the letter of January 2, 1907, the first endorsement of January 9, 1907, and your endorsement of January 10, 1907, after you had received them back in your office?

Mr. Platt: That is objected to; there is nothing to show the Bliss Company was cognizant of it or had anything to do with it.

The Court: He may answer.

A. I transmitted the papers, with the additional endorsement, to the Bureau of Ordnance.

By the Court:

Q. In other words, you mailed them?

A. I mailed them.

By Mr. Coles:

Q. Was that the regular method of procedure in operation at that time?

A. It was the regular method of procedure and it was my report on what I had done with the papers.

Q. What is the date of your report to the bureau as to what you did with those papers?

Mr. Platt: That is objected to as not binding on the Bliss Company.

The Court: I will allow it.

Mr. Platt: I except.

A. My report to the Bureau on the letter of January 2nd, which bears the first endorsement of January 9th, was dated January 21st.

Q. I now call your attention to a certified copy of the letter from the Bureau of Ordnance to the Bliss Company, dated November 9, 1906, which appears on pages 98 and 99 of folio B, marked for identification. I call your attention particularly to paragraph 4 thereof.

A. I have noted the paragraph.

Q. State whether you recall receiving this letter in the course of your business in your office and what you did with it.

Mr. Platt: That is objected to on the ground that the contract states the kind of notice that is admissible in the case and this is not a notice such as is provided for in the proviso of the 19th clause of the contract of 1905.

Mr. Coles: May it please the court, this letter is referred to at this time for the purpose of showing, while the design was not furnished then, the attention of the Bliss Company was called, in advance to the purpose of the Government to transmit them a design which subject was transmitted on January 9, 1907.

The Court: I will take it at this time for what it is worth, subject to a motion to strike out.

A. I received this letter in the regular course of business through the mails and in the regular method, sent it to the Bliss Company.

Mr. Coles: I now offer this letter in evidence.

It is admitted that the Bliss Company received the letter and the letter is marked Exhibit 30.

Mr. Coles: I also offer in evidence certified copies of the letter of October 17, 1906 with its endorsements appearing on pages 93 to 96 of folio B, from the Bliss Company to the Bureau of Ordnance.

The papers are received in evidence and marked Exhibit 31.

Mr. Coles: I now offer in evidence a letter from the Bureau of Ordnance to the Bliss Company, dated October 22, 1906, which appears on pages 96 and 98 of folio B.

The letter is received in evidence and marked Exhibit 32.

Mr. Coles: I call the attention of the court particularly to paragraph 3.

Cross-examination by Mr. Platt:

Q. When did you receive this blue print marked Exhibit 28 from the bureau?

A. The receiving stamp is marked January 4, 1907.

Q. You have no recollection of any different date than that you see on the receiving stamp, have you?

A. No recollection.

Q. You received that with the letter of January 2?

A. That accompanied the letter of January 2nd.

Q. Now this letter of January 2, Exhibit 29, is addressed to the Chief of the Bureau of Ordnance at Washington. Had that letter gone from Commander Gleaves to Washington and then returned to you by January 4th?

A. Look at the receiving stamp.

Q. The letter bears on its back the same stamp: "Bureau of Ordnance, received January 4th." Does that mean you received it on January 4th or that it was received at the Bureau of Ordnance on January 4th?

A. It was received with the Bureau of Ordnance stamp of January 4th. I do not find my stamp on it.

Q. You mean the letter of January 2nd has a stamp on it which shows it was received at the Bureau of Ordnance on January 4th?

A. Yes.

Q. The Bureau of Ordnance received it in Washington on January 4th?

A. Yes.

57 Q. Then how is it you can remember that you received this blue print on January 4th, together with the letter?

A. The stamp on that blue print bears the stamp of the Bureau of Ordnance, January 4th.

Q. How is it you can remember so well that you received, at your office this blue print on January 4th, together with the letter of January 2nd, when the letter of January 2nd was in the Bureau of Ordnance in Washington on the 4th?

A. I stated that the blue print bore the receiving stamp of the Bureau of Ordnance of January 4th.

Q. Didn't you just say, in answer to my question, that you received it in your office on January 4th?

A. No, sir.

Q. Now you say that the blue print was received in the Bureau of Ordnance on January 4th?

A. I say it bears the receiving stamp on its back, "Bureau of Ordnance, January 4, 1907."

Q. Now, when did you get it?

A. I received it with the letter, on January 10th.

Q. You mean the letter of January 2nd?

A. The letter of January 2nd with the Bureau of Ordnance endorsement of January 9th.

Q. How do you know you received this on the 10th of January?

A. That was the day I transmitted it to the Bliss Company, as shown by the endorsement on the correspondence. I have no independent recollection. I take it from the correspondence.

Q. Have you any independent recollection of the receipt of this letter of January 2nd, and this paper dated January 9th, other than what you infer from what you see on this paper dated January 10th?

A. I know I received these papers.

58 Mr. Platt: I move to strike the answer out as not responsive.

The Court: Strike it out.

By the Court:

Q. The question relates to how you know you received that on January 10th. You haven't any independent recollection of it?

A. I know I received the papers and my memory is refreshed by the dates on the papers, but I have no recollection of receiving these papers on a certain date.

Q. You do have an independent recollection of receiving them?

A. I know positively I received them. I remember definitely receiving those papers.

By Mr. Platt:

Q. Do you remember receiving them by mail?

A. They were received through the mail.

Q. You opened the mail yourself?

A. I won't say. I either opened it myself or it was opened in my office.

Q. Do you remember having this letter of January 2nd, with this paper of January 9th, in your office?

A. I remember definitely having those papers in my office.

Q. Do you remember definitely and independently what you did with them?

A. I remember definitely and independently what I did with them.

Q. What did you do with them?

A. I endorsed them on January 10th, or I endorsed them, leaving out the date and sent them to the Bliss Company.

Mr. Platt: I move to strike that out as a conclusion.

By the Court:

Q. What did you do with them?

A. I endorsed the papers and they were removed from my office.

59 By Mr. Platt:

Q. After you endorsed the papers what was the next thing you did?

A. I left them in the basket for collection through the mail.

Q. Did you see anyone take them from the basket?

A. I did not.

Q. Is that your inference because that was the usual course of business or do you remember putting them in the basket?

A. I remember putting them in the basket, and because they were delayed so long in my getting an acknowledgment, I repeatedly asked Mr. Page if he would acknowledge that letter, and not receiving any acknowledgement, the paper was returned to my desk and I reported to the Bureau. I could get no written acknowledgement and I stated the stamp of the company was sufficient data for me to report it had been in their possession.

Q. Where did you have this conference with Mr. Page about this letter?

A. In the regular course of business.

Q. Where did you have it?

A. Both over the telephone and in his office.

Q. By Mr. Page you mean Frank C. B. Page, Vice President of the Bliss Company?

A. Yes.

Q. You swear positively that you asked Mr. Page repeatedly for an answer to this communication of the 9th of January and couldn't get it?

A. To the best of my recollection.

Q. Did you see him personally?

A. I saw him personally and talked with him.

Q. Between the 9th of January and the 21st?

A. Between the 9th and the 21st.

60 GEORGE W. WILLIAMS, being called on behalf of the plaintiff, and having been duly sworn, testifies:

By Mr. Coles:

Q. Will you please state your name, age, residence and occupation?

A. Commander U. S. Navy, residence Naval Torpedo Station, Newport, Rhode Island; occupation, naval officer.

Q. What is your personal rank in the navy?

A. Commander.

Q. How long have you been in the service?

A. My continued service dates from October 1, 1886.

Q. What was your tour of duty in 1906 and 1907?

A. The Bureau of Ordnance.

Q. What was the custom in the Bureau of Ordnance during that period in reference to numbering and initialing communications sent out by the Bureau?

A. Each main subject of correspondence was assigned a number; each letter, or such letters as bore on one particular phase of each large subject was assigned a sub-number; the two numbers were separated by an inclined line. The main divisions of the Bureau work was distributed among desks and each desk was assigned a symbolic letter.

Q. What was your designation of the work handled by you in the Bureau?

A. "G."

Q. What was the custom of the Bureau during your tour of duty there as to the method of transmitting letters from the Bureau to the Bliss Company?

A. The letters were forwarded through the regular mails in an envelope addressed to the Inspector of Ordnance Works of E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y. The letters were addressed to the E. W. Bliss Company by way of the Inspector of Ordnance.

61 Q. From your experience while in the Bureau can you give any reason why this course was adopted?

A. It was a custom of long standing, since the Inspector of Ordnance, was a representative of the Bureau, letters were sent through him so that he could keep in touch with the work.

Q. Did you, during that time, have knowledge of any difficulties

the Bureau had experienced in obtaining acknowledgements by the Bliss Company of communications which had been sent directly to it.

A. I remember no instance of the Bliss Company refusing to answer a letter or acknowledge a letter of the Bureau, except as reported by the Inspector of Ordnance of the E. W. Bliss Company. There were other departures from the rule by the E. W. Bliss Company.

Q. Please explain what your duties were in the Bureau of Ordnance?

A. I was assistant to the Chief of the Bureau, acting in an advisory capacity in regard to the administration and technical matters, as regard torpedoes, mines and fire controllers.

Q. I call your attention to Exhibit 29 and ask you if you recall having received in the Bureau a letter of January 2, 1907, from the torpedo station with the inclosure mentioned therein?

A. I do.

Q. I call your attention to the Bureau's communication dated January 9, 1907, transmitting the letter of January 2, 1907, from the Bliss Company to the Inspector of Ordnance at its works. Please state, if you know, who wrote that letter?

A. The first endorsement of January 9th bears my initials. That is evidence that I vised it to the Chief of Bureau's signature.

Q. I ask you to examine the blue print, Exhibit 28, and state when it was received in the Bureau and how you know it.

62 A. The Bureau's stamp, which I recognize states that it was received on January 4, 1907.

Q. Was that blue print sent with the Bureau's communication of January 9, 1907?

A. I gave instructions that it should be sent. The endorsement is marked one inclosure, bearing the same number.

Q. Could that blue print have left the Bureau with any other letter except the letter of January 9th, 1907, without having another stamp or number upon it?

A. The blue print probably went independently in a separate envelope.

By the Court:

Q. Then that "one inclosure" does not refer to the blue print?

A. Yes. That is a Bureau convention; it refers to accompanying papers.

Q. What reason have you for thinking it went separately?

A. The custom. I say probably it went separately. I was answering the question which he asked as to whether it could possibly have gone with another envelope.

Mr. Coles: I ask to have the question read.

The question was read to the witness and he answered:

A. The cross reference on the blue print and in the letter both bear the same file number, establishing their connection.

Q. How many years were you in the Bureau of Ordnance?

A. I was on duty in the Bureau of Ordnance from May, 1906, to June, 1908.

Q. During that time were you connected with and did you have an opportunity of observing the various torpedoes under construction and in use?

A. Yes.

63 Q. Were you familiar with the turbine used before the balanced turbine was used?

A. Fairly familiar with its general arrangement.

Q. Are you familiar with the construction and operation of what is known as the balanced turbine?

A. Fairly well familiar.

Q. Have you examined the turbine in general embodied in the torpedo which is marked for identification No. 27?

A. I have.

Q. What type of turbine is that embodied in that torpedo?

A. At the torpedo station we call it a balanced turbine.

Q. Please explain briefly to the court how the balanced turbine operates and wherein its operation differs from what is called an unbalanced turbine.

A. A balanced turbine so-called consists of two turbine wheels revolving in opposite directions mounted on concentric axes. The products of combustion flow from the combustion pot (super heater) through small orifices called nozzles and impinge upon the blading of the first stage turbine giving up some of its energy and revolving this turbine at a high rate of speed. In passing through the buckets of the first stage the direction of the gases is changed to a greater or less extent in the opposite direction from which they are traveling when they impinge in the first stage turbine and strike upon the buckets of the second stage turbine, revolving that wheel in an opposite direction. The two axles of the turbine wheels are intergeared, and in the case of the torpedo on exhibit are geared with two concentric shafts, one of which turns the forward propeller, the other the after propeller of the torpedo. In the case of the so-called unbalanced turbine the gases, the product of combustion, pass through the nozzles, and impinged upon the first stage turbine, were

64 more or less reversed in direction; impinged upon blades fixed between the first and second stage, were changed nearly to the original direction, and impinged upon the second stage buckets, the two turbine stages being in one wheel.

Q. In what direction did the two stages of the turbine wheel rotate?

A. Counterclockwise in the case of the single turbine.

Q. Did the turbine of what is known as the unbalanced type revolve in the same or in opposite directions?

A. There is only one turbine wheel in the unbalanced type. In the balanced type there are two revolving in opposite directions.

Q. How does the balanced type differ in operation and results attained from the former unbalanced type of turbine?

A. In the case of the unbalanced type of turbine, the impact of the gases on the turbine wheels acted in one direction; the contrary and reaction of this impact acted on the nozzles the fixed blading and the body of the torpedo in the opposite direction. While the propellers were doing no work during the time the torpedo was in the

air the mutual reaction between the turbine and the torpedo caused the torpedo to heel to starboard so that frequently it struck the water and heeled at least 90 degrees to starboard, bringing the control rudders in planes at right angles with the planes in which they were designed to work, and set up an initial roll in the torpedo which caused very erratic performances. In the case of the balanced turbine the reactive forces on the torpedo consisted only of the reactive force of the reaction in the nozzles and the force of the exhaust, and these were in opposite directions, thus greatly decreasing the heeling impact so that the torpedo would strike the water with very much less heel than in the case of the unbalanced turbine and
65 eliminating the main cause of the erratic behavior of torpedoes fitted with unbalanced turbines.

Q. Where and by whom was the balanced turbine structure for torpedo first brought to your attention?

A. The balanced turbine construction was first brought to my attention soon after I reported for duty in the Bureau. I think in the latter part of the month of May, 1906, at the Naval Torpedo Station. It is more than probable that I had reference to this turbine in the Bureau files which I consulted when I took over the torpedo desk.

By Mr. Platt:

Q. When did you say you took that desk?

A. May, 1906.

By Mr. Coles:

Q. I call your attention to the blue print which is No. 56½ in folio B for identification and ask you if you recall ever seeing the design of the device therein disclosed and if so where?

A. This blue print is a study. It is not a device. I saw it in the early part of my tour of duty at the Naval Station in the latter part of the year 1906, as I remember.

Q. What does that blue print disclose?

A. This blue print is practically a diagram showing an arrangement of two turbines.

Q. What type of turbine is indicated in that blue print?

A. The balanced type.

Adjourned to November 11, at 10.30 A. M.

66 BROOKLYN, November 11, 1913.

Met pursuant to adjournment, present as before.

GEORGE W. WILLIAMS, resumes the stand.

Direct examination (continued) by Mr. Bick:

Q. I again call your attention to the blue print, being on page 56½ of folio B for Identification, which you stated you saw for the first time the latter part of 1906.

A. The latter part of May, 1906.

Q. Did you at any time see a drawing or a diagram showing the balanced turbine system before this blue print?

A. I have no recollection of ever seeing one before this blue print. The blue print, being page 56½ of folio B, is offered in evidence.

Mr. Fraser: Objected to as not proven, and as incompetent, not being any way binding upon the defendant here.

The Court: It may be accepted as part of the witness' narrative of this transaction.

Defendant excepts.

The blue print is marked Exhibit 33.

Q. After you saw this drawing known as Exhibit 33, when was the next time you had anything to do with the balanced turbine type of engine?

Same objection, ruling and exception.

A. A report came in from the torpedo station to the Bureau and was referred to my desk.

Q. When was that and by whom was the report made?

67 A. It was in the middle of the summer, July or August, 1906. The report was made by the Inspector of Ordnance in charge at the Naval Torpedo Station, commander Albert Gleaves.

Mr. Fraser: I suppose it is understood that all this testimony is taken subject to the objection and motion to strike out.

The Court: Yes. Mr. Williams is not the sole repository of the prior art, of course.

Exception.

Q. At about that time, in July or August, 1906, did you visit the naval torpedo station at Newport?

A. I visited the naval torpedo station at Newport in May, 1906, and at intervals during the remainder of the year.

Q. At any of these visits to the torpedo station, were there present any representative or representatives of the E. W. Bliss Company?

A. I can't state whether there were or not.

Q. Do you recall whether, during the year 1906, at any tests made of torpedoes, there were present any representatives of the Bliss Company?

A. Not to my knowledge.

Q. At any time that you were present at tests of torpedoes were there present representatives of the Bliss Company?

A. There were, at Sag Harbor.

Q. Well, I asked you at any tests. When was this Sag Harbor test?

A. I visited Sag Harbor in May, 1906, and several times during the summer and fall of 1906.

Q. At these tests at Sag Harbor, were there present any representatives of the Bliss Company?

A. Yes.

Q. When, about, were those tests made that they were present at?

A. The so-called tests at which I was present were the regular

68 acceptance runs of the 5-meter by 45-centimeter Mark 3 Bliss-Leavitt torpedoes which the company at that time had submitted for arranged tests before the Inspector of Ordnance to E. W. Bliss Company.

Q. Were those torpedoes some of the torpedoes that were contracted for in the contract of 1905, as you recall?

A. I recall distinctly the 18-inch torpedoes; I think there was an earlier contract.

Q. The turbines in the torpedoes that were being tested at Sag Harbor at that time, were they of the balanced or the unbalanced type?

A. They were of the double stage unbalanced torpedo, one wheel revolving in an anti-clockwise direction.

Q. Who was present of the defendant company at these tests, as you recall?

A. I recall Mr. Leavitt, Mr. Page, and the crew of the barge.

Q. At these tests what did you notice in regard to the operation and the action of the torpedoes submitted for inspection?

A. The torpedoes generally were subject to errors in direction and in depth, in performance.

Q. At that time did you have any conversation with either Mr. Leavitt or Mr. Page relative to that discrepancy or error in the operation of the torpedo?

A. There was a general discussion of the performance of the torpedoes, and several theories advanced in regard to the causes of their erratic behavior.

Q. Who took part in this conversation?

A. The Assistant Inspector at Sag Harbor, Mr. Leavitt, Mr. Page and myself. It was, together with other representatives of the Bliss Company, a general discussion.

Q. What was said at this discussion? State if you can who made the various statements.

A. As I remember it, there were no absolute conclusions reached as to the causes of its erratic behavior.

69 Mr. Fraser: Objected to as not responsive; the witness should state exactly what the question calls for.

The Court: State the discussion.

A. I remember that Mr. Leavitt's opinion was that the erratic behavior was in some way connected with the method of adjustment of the diving mechanism, as the sheers of the torpedo, which was the most pronounced evidence of erratic behavior, took place at that portion of the run where unlocking approximately took place in the torpedo.

Q. Was any suggestion made by Mr. Leavitt as to how this could be remedied?

A. There were changes made in the locking adjustment of the diving mechanism in an attempt to determine whether the adjustment of the locking gear had anything to do with the sheering or not.

Q. Did Mr. Leavitt at that time, or during any of these tests,

make any suggestion as to the installation of the balanced turbine type of engine?

A. I have no recollection of any such suggestion from Mr. Leavitt.

Q. Was any suggestion made at any of these tests in which the representatives of the Bliss Company were present, of the results of the balanced turbine type of engine?

A. Not to my knowledge.

Q. I mean that you were present at.

A. That I was present at, yes.

Q. At the time that these tests were made during 1906, were you personally familiar with the balanced turbine type of engine?

A. I was not familiar with the details of the balanced type of turbine engine. I knew the torpedo station at that time was experimenting along those lines.

Q. Were you present during 1906 and prior to these tests
70 where the Bliss Company was present at any tests made of the balanced turbine type of engine?

A. I have no recollection of being present at any tests.

Q. During the year 1906 did you see a balanced turbine engine?

A. I have no recollection of seeing a balanced turbine during the year 1906.

Q. When was your attention first called to the balanced turbine type? Where did you first see one?

A. I think in the works of the E. W. Bliss Company in Brooklyn, New York, in January or February of 1907.

Q. Is that the very first time that you personally saw the balanced type of engine?

A. The engine itself, I have no recollection of seeing one earlier than that.

Q. That is the engine itself?

A. As I recollect that engine itself was not then yet ready for installation in a torpedo; it was in course of assembling.

Q. Prior to that time, were you present at the torpedo station, together with Lieutenant Davison, when an experiment was made of the theories of Lieutenant Davison as to the balanced turbine type of engine?

A. I was not.

Q. While you were in the Department during the year 1906 and in the Bureau of Ordnance, were you receiving reports from Lieutenant Davison at the torpedo station, as to the balanced turbine type of engine?

A. The reports were signed by the Inspector of Ordnance in charge, Commander Albert Gleaves.

Q. Did they, in a general way, without giving the contents of them, relate to the balanced turbine type of engine which was being developed up there?

A. Yes.

Q. When was the next time that you were present at any
71 tests made of the torpedo, at which the Bliss people were present?

A. During the spring, summer and fall of 1907.

Q. Where were those tests made?

A. At Sag Harbor, New York.

Q. Who was present from the Bliss Company at that time?

A. Representatives of the company, different ones at different times. I remember Mr. Leavitt and Mr. Page, and I think Mr. Lane was present.

Q. At the tests made in 1907, what type of engine was used?

A. The balanced turbine type was used in 1907, and I believe there were still some running with the unbalanced type of torpedo not delivered under the previous contract.

Q. At the 1907 tests were any statements made by the representatives of the Bliss Company, or any of them, as to the balanced turbine engine that was installed in the torpedo?

A. I remember no particular statement.

Q. Did you examine the type of engine that was being used in those torpedoes known as the balanced type?

A. Yes.

Q. Did you compare them with the balanced turbine engine which had been devised and designed by Lieutenant Davison?

A. Mentally, yes.

Q. How did they compare?

Mr. Fraser: Objected to as a conclusion.

The Court: Go on.

Defendant excepts.

A. They were essentially the same in principle. There were differences in dimensions——

Mr. Fraser: I move to strike that out as a conclusion.

The Court: No, you can cross-examine him on that.

72

Defendant excepts.

A. (Continued.) There were differences in dimensions, there were differences in method of gearing the turbine to the shafting of the torpedo.

Q. How did they compare in reference to the balanced turbine principle?

A. They were essentially the same, as far as the principle of balance was concerned. There were two bucketed turbine wheels revolving in opposite directions, and geared together.

Mr. Fraser: I move to strike out the witness' statement as to similarity of principle, as a conclusion.

Motion denied. Exception.

Q. These torpedoes which were offered for test in the summer of 1907, were they to your knowledge the first torpedoes submitted for inspection containing the balanced turbine principle?

A. Yes.

Q. Those which had been submitted prior thereto contained the unbalanced turbine principle?

A. Yes.

Q. These experiments which were made during 1907 were made, were they not, after January 2nd, 1907?

A. Yes.

Q. I show you what we will call Exhibit 34 for identification, and ask you if you know under whose direction that paper was prepared?

A. It was prepared under my direction, by order of the Bureau of Ordnance.

Q. When did you prepare that? About what time?

A. It was prepared at the naval torpedo station within the last month.

Q. From what was that paper prepared?

A. The data was obtained from blue prints taken from the original tracings on file at the naval torpedo station, except
73 possibly in the case of the drawing in the lower lefthand corner, which was taken from the blue print furnished by the E. W. Bliss Company.

Q. What do the dates on that paper, and under each design, represent?

A. They represent the dates of approval of the drawings, of which these are diagram-atic representations, except in the case of the drawing in the lower lefthand corner.

By the Court:

Q. By whom?

A. The Inspector of Ordnance in charge of the naval torpedo station.

By Mr. Bick:

Q. Do you know what the design in the lower lefthand corner is?

A. The diagram-atic representation of the turbine fitted to the 5.2 meter by 45 centimeter Mark 7, Bliss-Leavitt torpedo.

Q. Is that the engine which is now installed in the present torpedo?

A. Yes.

Q. I now show you what we will call Exhibit 35 for Identification, being a blue print approved September 24, 1906, and ask you what that is.

A. This is a blue print taken from a tracing on file at the naval torpedo station and is a design of a balanced turbine prepared at the naval torpedo station and approved by Albert Gleaves, Inspector in charge on September 24th, 1906.

Q. Where, on Exhibit 34 for Identification, is the drawing of that blue print, on that diagram?

A. The upper right hand corner.

The Court: Are you going through each one of them this way?

Mr. Bick: Yes.

The Court: Then you had better mark them. Mark them the letters A, B, C, D, etc.

74 Mr. Bick: Then, if the court please, I offer in evidence at this time, blue print No. 26802, blue print No. 26803, the first being of September 24, 1906, and the second being of October 4,

1906, blue print of November 12, 1906, the original blue print tracing of January 2nd, 1907, being 117-E (which is similar to the one that was produced here by the defendant on the motion for a preliminary injunction), and blue print of May 13th, 1912, made by the Bliss Company, together with the diagram drawing made at the request of the commander, being known as Exhibit 34.

The papers are marked Exhibits 35 to 39 inclusive.

Mr. Bick: For the record I will state that the purpose of introducing these blue prints in evidence is to show the development of the balanced turbine principle in the Department, leading up to the final adoption of it as now put in the Bliss-Leavitt type of the torpedo at present in use, being known as Exhibits 35 to 39 inclusive.

Mr. Fraser: Blue prints Exhibits 35 and 36 and 37 are objected to as incompetent, irrelevant and immaterial, because they purport to emanate from the torpedo station at a time prior to any notice or communication to the defendant under the contract.

The Court: I will take it for the present, and you can renew your motion later on.

75 Mr. Bick: If the court please, I ask, for the purpose of the record, that it be noted that Exhibit 38 now offered in evidence is a duplicate of Exhibit 28, being the 117-E blue print, and so as not to encumber the record we will withdraw Exhibit 38.

Cross-examination by Counsel for defendant:

By Mr. Fraser:

Q. I show you the blue print Exhibit 28 and the letter Exhibit 29 and ask you to explain the stamps of the Bureau of Ordnance which are impressed on the back of these. These are obviously different stamps. Please state what was the use of those stamps.

A. They were stamps, official stamps, used in the Bureau of Ordnance. My recollection is that the stamp on the letter January 2nd, 1907, is the stamp used by the mail clerk in the file room. The other is the stamp used for stamping enclosures at the same place; the blue print stamp.

Q. Then you mean that the stamp applied to the letter is one that was used on incoming mail, and the one applied to the blue print is the one used on out-going mail; is that correct?

A. No.

The Court: He doesn't say so.

Q. You mean then that a different stamp was used on a letter received and on an enclosure with that letter received?

A. Yes, it shows on the face of it that it is an enclosure stamp, as it has a space for marking the number of enclosures.

Q. You testified yesterday that the cross reference on the blue print and in the letter both bear the same file number, establishing their connection. Is that the way that you connect the two in your memory?

A. Yes.

76 Q. That is to say, you rely upon the identity of those numbers in order to identify these two papers?

Mr. Youngs: Objected to; let him state how he identifies.

The Court: Well, it is cross-examination; he may answer the question.

Exception.

A. Not entirely. I remember that letter and a blue print of that drawing, or one very much like it, was sent to the E. W. Bliss Company early in January, 1907, by way of the Inspector of Ordnance at the work of the E. W. Bliss Company.

Mr. Fraser: I move to strike out so much of the answer as states that it was sent to the E. W. Bliss Company, as beyond the witness' knowledge.

The Court: He can describe how these letters were mailed.

Exception.

Q. As matter of fact, do you know anything further than that these were sent to the Inspector at the Bliss Works?

A. There is a statement on the letter itself which states that they were received by the Inspector of Ordnance at the Works of the E. W. Bliss Company.

Mr. Fraser: I move to strike that out.

The Witness: I remember receiving and reading that statement at the time.

Mr. Fraser: I move to strike that out.

Repeat the question.

The question and answer are read.

The Court: It is an answer as far as it goes, still it doesn't cover the matter that is asked about.

77 Mr. Fraser: I want a direct answer.

The Court: Ask him another question.

Q. Do you know anything further about these two papers than that they were mailed to the Inspector at the E. W. Bliss Company works?

A. I have no knowledge of what happened to those papers after I initialed the first endorsement of January the 9th, 1900—let me verify that, please—(Refers to paper), January the 9th, 1907, and placed it on my desk for transmission to the desk of the chief clerk of the Bureau of Ordnance, until it was returned to my desk from the file room, and I noted and ordered it filed.

Q. You have no personal knowledge as to what happened to it in the meantime; is that correct?

A. I have no personal knowledge; I was not present with it.

Q. Now, referring to this drawing, Exhibit 34, I understand that the figure at the upper left hand corner, marked January 2, 1907, is a reproduction of the design shown in the blue print Exhibit 28 which accompanied that letter Exhibit 29. Is that correct?

A. No, it is an illustration. It is merely an illustration; it is not a reproduction.

Q. That is to say, it shows the same construction, the same type?

A. A diagrammatic representation of the gearing arrangement of the different parts; it is not drawn to scale.

Q. But the parts are the same parts, and they connect together in the same way.

A. It is simply to show the inter-connection of the two turbine wheels and the gearing and the shafting; the details are not shown at all.

Q. Is the construction the same or is it different from that shown in the blue print, Exhibit 28?

A. This represents the general action of the mechanism of a turbine of the design which is shown on that blue print.

Q. If I correctly understand you you mean that this colored drawing is substantially identical in construction with that shown in the blue print, but may be slightly changed in detail, but not in principle: is that your meaning?

A. That colored drawing was made to show the movements—the direction of movement of the turbine wheels and the gearing.

Q. Yes, I understand that; but you don't answer as to whether the construction is substantially identical with that shown in the blue print.

A. There is no construction shown in that illustration; it is not a working drawing.

Q. You mean then merely that while the moving elements are the same, it is not drawn to scale; is that your meaning?

A. That the movements shown are the same.

Q. What can you say for the figure in the lower left hand corner of this colored drawing, Exhibit 34; what does that show?

A. That purports to show the operation—the direction of movement of the parts of the Mark 7 torpedo.

Q. That is the existing type of the Bliss-Leavitt torpedo?

A. Yes.

Q. When you say these drawings show the movement of the parts, just what do you mean?

A. It will be noted that these colored drawings are in two colors, blue and red, and that at a certain point in the train of gearing certain portions of the drawing are colored both blue and red. At these parts of the train the efforts of the two turbines are joined in one piece of the mechanism. As long as the parts are solidly colored it shows that they are subject to the effort of that particular turbine wheel.

Q. Now, referring to the upper left hand figure, is it not the fact that the turbines turn upon an axis which is supposed to be co-incident with the longitudinal axis of the torpedo itself?

A. Yes.

Q. Referring to the lower left hand figure showing the present type of torpedo, is it not a fact that the turbines turn on a vertical axis, that is to say, an axis at right angles with the longitudinal axis of the torpedo itself?

A. Yes.

Q. Referring to the upper figure, the January 1907 figure, if in that arrangement the two turbine wheels were fixed together as one wheel turning in one direction, that is, as you testified yesterday,

the reaction against the nozzle would tend to give the torpedo a roll or list, would it not?

A. Yes.

Q. It is that reaction that you claim to be eliminated or partly neutralized by the sub-division of the turbine into two wheels turning in contrary directions, is it?

A. Yes.

Q. Take the lower figure showing the existing type of turbine. Suppose that had only one wheel; what would be the effect of the reaction in that case upon the torpedo?

A. It would differ in degree, only.

Q. Would it tend to make the torpedo roll or list?

A. Yes.

Q. In what direction?

A. I will say that this is more complicated than the other. You have to take it through the gear train. If the nozzle is pointing to the left the gases will impinge on the bucket and there will be a reaction tending to heel the torpedo to the right. This reaction will be more or less balanced, however, by the pressure on the pivots on the axle bearing of the turbine wheel; but in the bevel gearing at the bottom of the turbine wheel there will be action and reaction between the horizontal shafting and the vertical shafting, which will tend to twist the turbine and the framing and the torpedo around the shaft as long as the torpedo is in the air, by an amount which will depend upon the relative moments of inertia of the torpedo shafting and propellers, and the speed and power of the engines.

Q. As to the nozzle reaction alone, what is the tendency of that in the arrangement shown in the upper left hand figure; is it not directly to give the torpedo a roll?

A. The nozzle reaction considered alone, yes.

Q. Now take the nozzle reaction alone when the turbine is arranged to turn on a vertical axis, as in the lower figure.

A. If there is a nozzle reaction alone, yes.

Q. Is it not the fact that when the gases impel the wheel in one direction there is an equal counterforce or reaction in the contrary direction against the nozzle?

A. Yes.

Q. And when the turbine wheel revolves horizontally upon a vertical axis, is not the direction of that reaction such as to tend to divert the torpedo, as a whole, in the horizontal plane?

A. No—please repeat the question.

The question is read to the witness.

Q. Does it not follow from your previous answer that the reaction tends to turn the torpedo in the contrary direction to what the direct action is turning the wheel?

A. Oh, I thought you meant turn the torpedo laterally; you mean to revolve, revolve it around the center axis?

Q. I mean does not the reaction take effect against the torpedo

in such direction as to tend to slew the torpedo around the vertical axis of the turbine?

A. It does.

Q. In a torpedo, considering its mass and considering the mass of the turbine wheel, would that slewing effect be a perceptible quantity, or would it be negligible?

81 A. Well, it is apparently within the power of the directing force, of the directing mechanism in the torpedo to control.

Q. That is, you mean if it is a perceptible quantity it occurs in such direction that the steering rudder can correct it; is that your meaning?

A. Yes.

Q. So that in this respect the two constructions have a different mode of operation; isn't that so?

A. Yes, the constructions are differently arranged.

Q. That is to say, with the January 1907 construction as shown in the upper figure, the reaction upon the nozzle has no effect or tendency to slew the torpedo in a horizontal plane, whereas with the present construction shown in the lower figure, the nozzle reaction does have a tendency to slew the torpedo in a horizontal plane?

A. Yes.

Q. With the January 2nd, 1907 construction shown in the upper figure, the gearing which transmits the motion is mounted entirely to turn on axes parallel with the longitudinal axis of the torpedo itself, is it not?

A. Yes.

Q. With the present construction shown in the lower figure, is it not true that the only gears which turn upon the longitudinal axis of the torpedo are the gears which are fixed to the propeller shafts?

A. The horizontal longitudinal axis?

Q. Yes.

A. The only gears which turn in the vertical plane?

Q. Yes, that is true, is it not?

A. The gearing shown fixed to the horizontal longitudinal shaft has its counterpart in the other arrangement which is not shown; they are the only two shown in this drawing which turn in the vertical plane.

Q. In the January 2nd, 1907 construction shown in the upper figure, all of the gears turn in the vertical plane, transverse to the longitudinal axis of the torpedo, do they not?

82 to the longitudinal axis of the torpedo, do they not?

A. Yes.

Q. In the present construction shown in the lower figure, all of the gears except the two which are fastened on the propeller shafts, turn in horizontal planes, do they not?

A. Yes.

Q. In the January 2nd, 1907 construction shown in the upper figure, only one propeller shaft is shown, **is it not?**

A. Yes.

Q. Please explain to the court how the two propeller screws at

the tail of a torpedo would be driven in that construction from that one shaft?

A. The ordinary arrangement and the one which has been in use for a great number of years was used at that time by the E. W. Bliss Company, consisting of a beveled gear keyed to the main shafting of the propeller, in the tail of the torpedo. This main shafting then continued to the rear, and on the after end of it carried a propeller; mounted in a framework in the tail of the torpedo were two idler beveled gears, gearing into the beveled gear keyed to the main shaft. Gearing into these two idler beveled gears from aft was another beveled gear keyed to a sleeve shaft surrounding the main shaft, having on its after end another propeller. This arrangement distributed power and caused the propellers to revolve in opposite directions,—divided the power.

Q. That is, the aft propeller was keyed on the main shaft?

A. Yes.

Q. And the forward propeller was driven from the main shaft through the gearing you have described?

A. Yes.

Q. That arrangement of gearing is shown in the Davison patent, Exhibit 3, figure 3, is it not?

A. Apparently; details are not shown.

Q. And in considering the upper left hand figure of Exhibit 34, the existence of such reversing gearing at the tail of the

83 torpedo is assumed, is it not?

A. Yes.

Q. With the construction shown in the lower figure, is there any such reversing gear at the tail of the torpedo?

A. The tail isn't shown; it would not be necessary; it isn't necessary.

Q. Is it actually used?

A. No.

Q. In the actual torpedo then, there is no reversing gear in the tail?

A. No.

Q. The fact is that in the existing type of torpedo the reversing gearing in the tail is dispensed with because the gearing that is located close to the turbine accomplishes the necessary reversal, is that not so?

A. No, the reversal is accomplished in the turbine; the gearing simply equalizes the work.

Q. Suppose you took off one of the turbine wheels; would there be a reversal or none?

A. If you put one turbine, you would have to put in reversal then.

Q. Suppose you took off the top turbine wheel, would there be reversal then or not?

A. The power of the bottom turbine wheel is reversed and the power of the top turbine wheel is reversed to a certain extent; in so far as they do not balance.

Q. If the top turbine were removed there would still be reversal, would there not?

A. The power transmitted to the other shaft would be reversed.

Q. So that the gearing does have some function of reversal, does it?

A. The gearing does have some function of reversal, but the cases are not parallel. I want to be fair. I want to say that the cases are not exactly parallel.

Q. You don't mean to say, do you, that in the present construction where the two turbines revolve in two directions that one turbine drives one screw and the other turbine drives the other screw, do you?

A. No, both turbines drive both screws; but the division
84 begins before the gearing; then they lock together and are divided again in the gearing.

Q. That is to say, the gearing has a double function?

A. The gearing has a double function, yes.

Q. So one function is to insure that the two turbine wheels shall revolve in contrary directions at equal speed, and the other function is that the driving force shall be reversed in its action through the two shafts upon the two propeller screws, is that correct?

A. The function of the gearing is to insure that the turbine wheels shall revolve at the same speed; and that the propellers shall revolve at the same speed in opposite directions.

Q. Of course another function of the gearing in both instances is to reduce the speed or gear down from the high speed turbine to the lower speed propeller screws, is it not?

A. Yes.

Q. It is then a fact, is it not, that the present construction of turbine and gearing accomplishes a function that could not be accomplished by the construction of January 2nd, 1907, shown in your upper left hand figure of Exhibit 34; is that not true?

A. It includes the gearing that performs the function with the stern gearing, which is understood as being necessary for the proper distribution of the work of the engine. Shown in the sketch in the left hand upper corner of the drawing.

Q. How many gears do you find in the upper figure of that drawing, including pinions?

A. There is a geared shaft on the after turbine, gearing into an idler, which gears into a parallel shaft, which carries a gear which gears into the main shaft, on each side of the main shaft. The gearing for the forward is the same, except that there is no
idler.

85 Q. Please count them; how many do you make?

A. There are twelve, I believe, not counting the shaft.

Q. How many do you count in the lower figure showing the present construction?

A. You might call it six or eight, one being combined gear.

Q. In your count of the gears in the upper figure, did you include the tail gears?

A. No, I did not.

Q. There being four of those, your count would make sixteen?

A. Sixteen.

Q. And your count of the gears in the present construction is six or eight?

A. Six or eight, whether you call that a double gear or not.

Q. Then the old construction, or January 2nd, 1907, construction, that, as you make it has sixteen gears altogether, whereas the present construction accomplishes the same result with six or eight gears; is that right?

A. It has a less number of gears.

Q. And in that proportion, if your count is correct?

A. Yes.

Redirect examination by counsel for the Government by
Mr. Bick:

Q. These variances as pointed out by you between the drawings in the upper left hand corner of January 2nd, 1907 and the one in the lower left hand corner of May 13th, 1912, were all of minor details of the turbine engine?

A. They were differences with regard to the gearing between the turbine and the shaft.

Q. That is, they were differences merely in the gearing?

A. In the gearing.

Q. But the balanced turbine principle is still in the present torpedo as it was represented in the drawing of January 2nd, 1907; is that right?

A. Yes.

86 Q. Referring to the diagram in the lower left hand corner of Exhibit 34 and in the horizontally arranged turbine, would not the reaction on the nozzle tend to rotate the torpedo about its longitudinal axis?

A. Considered alone, yes; you could do it if the torpedo were not there.

Q. You stated on cross-examination that there would be a tendency to swerve the torpedo about the vertical axis of the turbine. Would this tendency not be converted into a force tending to rotate the torpedo about its horizontal axis?

A. That part of it which is necessary to overcome the inertia of the parts moving in the opposite direction would tend to rotate the torpedo about a horizontal longitudinal axis.

Q. Will you please explain the reaction in detail, both at the nozzle and at the exit from the turbine?

A. The nozzle being pointed athwartship in the torpedo, ejecting gases at a high pressure as in the direction of its length, in the reverse direction of its length. The reaction acting, that is, a line in the torpedo—it is a plane perpendicular to the longitudinal axis of the torpedo; it therefore tends to roll the torpedo around that longitudinal axis. It is also in a plane perpendicular to the vertical axis of the turbine. It also tends to revolve the torpedo around that axis. But this will not act—this reaction will not act as a force alone.

There must be a couple in order to produce revolution. In the case of the vertical turbine the couple is easily understood; the other end of it is in the axis of the turbine. In the case of the turbine in the horizontal plane the other end of the couple is in the torpedo around that; but certain of that force is transmitted through that vertical shafting to the horizontal shafting. The horizontal shafting axis of the vertical turbine, tending to revolve the — has inertia; 87 it resists turning; the reaction from that resistance is transmitted through the beveled gearing to the vertical shafting and through the turbine to the air and into the reaction. Part of the reaction in that case tends to revolve the turbine. It differs only in degree. The inertia against which this force works depends upon the mass which it is attempting to turn in the opposite direction. This reaction takes place in a reciprocating engine. I have seen a Whitehead torpedo, which is a 4-cylinder reciprocating engine, accidentally start full speed in the tube in a similar manner to the unbalanced turbine, by turning over on its side.

Q. Does the balanced turbine principle, as is contained in the present type of turbine, sufficiently reduce these reactions to permit of their control or correction by the control mechanism of the torpedo? In answering that also answer whether that is true in this type as well as in the type which was submitted on January 2nd, 1907.

A. The present type exhibit of Bliss-Leavitt torpedo, Mark 7, has not yet been issued to service and I have very little information in regard to its performance in service. The Mark 6 torpedo (which, as far as its power plant is concerned is practically identical) is subject to very heavy rolling on ejection from the submerged tubes and is rather erratic in its behavior. The conclusions from its performance as to the balancing efficiency of the present arrangement of turbine and gearing cannot as yet be drawn, as the torpedo has not yet proved its efficiency under service conditions.

Q. Does not the effect of the air reaction at the exit counterbalance the tendency to reaction at the nozzle?

A. In which case?

Q. In the balanced type?

A. Yes, to a certain degree.

88 Q. But the tendency is there, to counterbalance?

A. Yes.

Recross-examination by counsel for the defendant by Mr. Fraser:

Q. In what you call the unbalanced turbine, you have said that there is an initial roll or list in launching through the air. Do you personally know that that occurs?

A. I have seen them heel.

Q. Then there is a heel or roll that is perceptible to the eye, is there?

A. There is.

Q. With the Mark 6 torpedo, as to which you say the power plant

is substantially identical with the Mark 7, can you say from your own knowledge as to whether there is any perceptible heel or roll with that in launching through the air?

A. Only from seeing rolling records.

Q. What do you know from that?

A. Well, I misunderstood your question. I don't know of my own knowledge.

Q. From these rolling records, what do you mean?

A. I misunderstood your question. I wish that answer stricken out.

Q. You testified that those Mark 6 torpedoes had an initial roll when launched from a submarine tube?

A. Yes.

Q. That information is derived from the rolling record, I suppose?

A. From the rolling record and reports.

Q. Do you know from the same rolling records and reports whether there is that same initial roll if that same torpedo were launched through the air?

A. I do not.

Q. As you understand it, the purpose of the balancing of the turbine was principally to overcome that initial roll?

A. I don't know what purpose actuated the designer.

89 Q. Aside from that that was its principal function, was it?

A. It corrected the initial roll, as a matter of observation.

Q. So that with the unbalanced turbine there was a perceptible initial roll in air launching and with the balanced turbine there was no perceptible initial rolling?

A. There was a very much reduced roll; very much reduced.

Q. Do you know whether any torpedo was ever constructed by the defendant having the identical construction of turbine and gearing shown in this blue print Exhibit 28, which is stated to have accompanied that letter of January 9, 1907?

A. Not to my knowledge.

Q. Do you know whether any orders were ever issued by the Bureau of Ordnance to the defendant to manufacture any torpedoes of the identical construction shown in this blue print?

Objected to as immaterial.

The Court: He may answer.

Exception.

A. Not to my knowledge.

Recess till 2 P. M.

90

BROOKLYN, November 11th, 1913.

Met pursuant to adjournment at 2 P. M.

ALBERT GLEAVES, being duly sworn and examined as a witness for the complainant, testifies as follows:

Direct examination by Mr. Bick:

Q. How long have you been in the United States Navy?

A. 40 years.

Q. You are now stationed at the Brooklyn Navy Yard?

A. Yes, sir.

Q. As commandant?

A. Yes, sir.

Q. During 1904 to 1907 where were you stationed?

A. In charge of the Torpedo Station at Newport.

Q. During that time were tests being made of torpedoes?

A. Yes, sir.

Q. And were various designs and devices being tested for the purpose of improving torpedoes?

A. Yes, sir.

Q. That work was done under your supervision?

A. Yes, sir.

Q. When was it that the balanced turbine type of engine was first called to your attention?

A. As near as I can remember it was sometime in 1906.

Q. And by whom was your attention directed to it?

A. Lieutenant Commander G. C. Davison.

Q. What were Lieutenant Commander Davison's duties at the naval station?

A. In connection with the development of the Bliss-Leavitt torpedo.

Q. I call your attention to Exhibit 33 and ask you if you recall seeing that drawing in the early part of 1906?

91 Same objection as to the previous questions concerning that same exhibit.

Same ruling.

A. I think it is probable that I did; I can't identify this.

Q. I ask you to turn to page 51 of folio B marked for identification, and ask you whether you can refresh your memory by reference to that communication, and particularly paragraph 7 of that letter?

A. I see by this letter of January 12th, 1906, which was signed by me, that I did enclose a blue print sketch showing the proposed change, and this sketch does show the proposed change from the first turbine to the balanced.

Q. And was that blue print or the original of that blue print made by Lieutenant Davison, as you recall?

A. I presume it was; I couldn't say that; I have reason to think it was.

Q. Were you present at certain tests of torpedoes which were made during 1906 at Sag Harbor?

A. Yes, sir.

Q. And at some of those tests were there present any representatives of the Bliss Company?

A. Always representatives from the Bliss Company.

Q. Who was always present at the test?

A. Mr. Leavitt, to the best of my recollection was always present.

Q. And at other times who was present?

A. Sometimes I met Mr. Lane and sometimes Mr. Page.

Q. Mr. Lane being president?

A. Mr. Lane was president and Mr. Page vice-president.

Q. Mr. Leavitt was the engineer?

A. Mr. Leavitt was the engineer.

Q. During the tests made in 1906 was there any conversation had between the government officers and the representatives of the Bliss Company as to any defects in the operation of the torpedo?

A. Yes, sir.

92 Q. Particularly as to what point?

A. The defect that the torpedo had of deviating from a rectangular course when it was fired in a horizontal plane.

Q. What is known as sheering?

A. Yes, sir.

Q. What style of turbine engine was being used in the torpedoes which were being tested at that time?

A. The Curtis turbine with both wheels revolving in the same direction.

Q. What is now known as the unbalanced turbine?

A. Yes.

Q. At any of these conversations was any explanation made by any representative of the Bliss Company as to the cause of the sheering?

A. I don't recall.

Q. Was any suggestion of any change in the type of engine from unbalanced to balanced turbine ever made by any representative of the Bliss Company?

A. Not to my knowledge or recollection.

Q. At the time that these tests were being made with the unbalanced type you were familiar with the balanced type theory?

A. With the theory of it, yes, sir.

Q. That is you had seen drawings and had received other information from Lieutenant Davison, is that right?

A. Yes, sir.

Q. During the progress of the development of this balanced turbine type of engine did you communicate and report those facts to the department?

A. Yes, sir.

Q. Did you make reports from time to time?

A. Yes, sir.

Mr. Fraser: Same objection as to the previous testimony on this line.

Same ruling.

Q. I call your attention to Exhibit 29 in evidence, and ask you whether that is a report made to the department on the day it bears date?

93

A. I recognize this as a letter of mine.

Q. That is the original?

A. Yes, sir.

Q. I ask you to look at Exhibit 28 and ask you whether that is one of the blue prints that accompanied that report?

A. Yes, sir. This is a blue print signed by me and marked 117-E, as in the letter.

Q. Which accompanied the letter?

A. Yes, sir.

Q. This Exhibit 28 which you testified was forwarded with Exhibit 29, your letter of January 2nd, was that the culmination of the experimenting and designing of Lieutenant Davison and the final drawing which he submitted to the department?

A. I don't know that it was the final drawing; I see in the letter that it is marked 3; that shows according to the condition of the torpedo, the state of development of it that that is the final thing up to that point, there having been two previous marks of the torpedoes; whether it was changed subsequent to that I don't know.

Q. Do you recall the experiments made during the year 1907 of torpedoes at Sag Harbor?

A. Not specifically, except that during part of that time we were testing out the balanced turbine; I don't recall anything specific.

Q. The first test on balanced turbines was made during 1907?

A. To the best of my recollection, yes, sir.

Q. It was the first time that you saw a torpedo with the balanced turbine in use?

A. Yes, sir.

Q. At the station prior to the test of the torpedo submitted by the Bliss Company did you have an experimental engine of the balanced turbine type; was there an experimental engine made?

A. My recollection of it is that we did have, and my recollection is that we tried it out in the tank there; I am not sure.

94 Q. It was before the torpedoes were tried out that the Bliss Company submitted?

A. I should say so, yes, sir.

Q. How did the torpedoes of 1907 operate in comparison with the torpedoes of 1906 as regards the sheering?

A. After the balanced turbine was put in the sheer was practically taken out of the torpedo.

Cross-examination by Mr. Fraser:

Q. You say that after the balanced turbine was constructed and applied to the torpedo the sheer was practically taken out of it; do you mean there was some sheer left?

A. I can't go into details because I don't remember; I wouldn't like to make a positive statement that it was all taken out; my recollection of it is that it was taken out; therefore, I said practically.

Q. Is this based upon your observation of the test?

A. Personal experience, yes, sir.

Q. You don't remember clearly enough to say that there was complete absence of sheer or not?

A. I wouldn't like to say the torpedo went absolutely straight in the direction in which it was pointed because it took a long time to rob it of all its eccentricities; I don't know whether it is yet or not.

95

BENJAMIN B. McCORMICK, recalled.

Direct examination by Mr. Bick:

Q. In reply to a question of counsel for the defense yesterday afternoon you made reference to conversations had with Mr. Page relative to acknowledging letter of January 9th, 1907; will you state what those conversations were or the substance of them as you recall it?

A. It is impossible for me to recall the conversations at that time, but refreshing my memory from the correspondence shown I recollect that I asked Mr. Page repeatedly to acknowledge the correspondence in reference to the balanced turbine, and I was unable to get a written acknowledgement, and being unable to acquire that written acknowledgment, when the papers were returned to my desk with the stamp of the Bliss Company I called attention to that stamp with my endorsement as the only evidence—

The Court: The question is what did you say to Mr. Page and what did he say to you.

A. At this time I am unable to recall the conversation excepting the fact that it took place, and I was unable to get the acknowledgment.

Q. That related to the request for acknowledgment of that letter?

By the Court:

Q. What did he say?

A. I am unable to recollect the conversation.

By Mr. Bick:

Q. You mean you do not recollect the exact language or that you do not recollect the conversation at all or the substance of it?

96 A. The substance of the conversation was that the acknowledgment in writing of that paper was evaded and I was put off.

By the Court:

Q. Did you ever ask him whether he got it?

A. Well there was no—the point was never raised about his having received it.

Q. What did he say; you say he evaded it; that does not leave us anywhere; you don't recollect anything he said?

A. I don't recollect any of the conversation.

Cross-examination by Mr. Platt:

Q. How many times do you think you talked with Mr. Page about this between the 10th of January and the 21st?

A. Two or three times.

Q. Do you remember talking with him over the telephone about it?

A. Yes, I remember calling up on the telephone.

Q. Did you ask him to answer this communication?

A. Yes, so I could return the correspondence.

Q. You mean this letter of January 2nd and the endorsement of the 9th?

A. And my transmitting endorsement of the 10th with the blue print which accompanied the whole correspondence.

Q. Do you remember when you spoke to Mr. Page whether you referred to this so as to identify it in any way?

A. There was never any question about identifying them.

Q. What did you say to Mr. Page?

A. I asked him to reply to the correspondence so I could forward the material back to the Bureau which I was required to do; that was the substance of the conversation.

Q. Did you explain what the correspondence was you were talking about?

A. Yes, sir.

97 Q. Do you remember where these conversations took place?

A. As I recollect I telephoned from my office and went to see him in his own office.

Q. Your office being up stairs and his down stairs in the same building?

A. Yes, sir, separated by two stories.

Q. You went personally and talked to him?

A. Yes, sir, to the best of my recollection.

MOSES J. O'BRIEN, being duly sworn and examined as a witness for the complainant, testifies as follows:

Direct examination by Mr. Bick:

Q. What is your occupation?

A. Clerk.

Q. Where?

A. In the office of the Naval Inspector of Ordnance.

Q. Were you stationed at the office of the Inspector of Ordnance during 1906 and 1907?

A. Yes, sir.

Q. In what capacity were you employed?

A. Sub-inspector.

Q. What were your duties as sub-inspector?

A. To act as clerk in addition to sub-inspector.

Q. To act as clerk and messenger?

A. Yes, sir.

Q. Any duties which the inspector——?

A. General office work.

Q. I show you Exhibit 29 and ask you if you ever saw that report?

A. Yes, sir.

Q. When was your attention first called to that exhibit?

A. January 10th, 1907.

Q. What was its condition at the time that you saw it; its physical condition?

A. There was a letter and one endorsement, and one enclosure, one blue print.

Q. On what day was it that you received this?

98 A. January 10th to the best of my recollection, January 10th, 1907.

Q. What was the date of the letter which you say the endorsement was annexed to?

A. January 2nd, 1907, the date of the letter.

Q. What was the physical condition of the letter and the endorsement as regards the facts as to whether it was connected or disconnected?

A. The letter with the first endorsement attached, glued, came to the office.

Q. That is, the first endorsement was glued on the back of the letter?

A. On the third fold, yes, sir.

Q. What was done that you know of with the letter and the first endorsement?

A. The letter was copied.

Q. Who copied it?

A. I did. The second endorsement was typed by me and muscled on the original letter and put over on Lieutenant Commander McCormick's desk.

Q. When you next saw it what was the condition of it as regards the second endorsement?

A. It was signed; the blue print was with the letter, and to the best of my recollection—

Objected to.

The Court: Testify to facts within your own knowledge.

Q. Then what did you do with the letter, with the first and second endorsement and blue print?

A. I delivered it to the office of the secretary of the E. W. Bliss Company.

Q. When you say you delivered it to the office what do you mean by that?

A. I mean by that by going into the secretary's office and leaving it on his desk or handing it to him if he was present and extended his hand for it; if not I would lay it on his desk.

99 Q. Do you recall in this instance whether the secretary was there at the time, or whether you laid it on his desk?

A. I can't recall.

Q. You recall the fact that you took it to the office and either delivered it to the secretary personally or left it on his desk?

Mr. Platt: I object to counsel leading this witness.

The Court: Yes.

By the Court:

Q. Can you testify as to whether you delivered it personally to the secretary; who was the secretary?

A. Mr. Seaman.

Q. Did you deliver it to Mr. Seaman personally or did you leave it on his desk, if you know?

A. I can't recall.

Q. Yet you remember taking it in?

A. It has been the custom for me to deliver papers to the office.

Q. That is not what you are asked; you are asked whether you recollect taking that in to the secretary's office?

A. No, sir, not when you put it right down that way; but to the best of my recollection, yes.

Q. We don't want your recollection; we want your testimony of the facts.

Mr. Bick: As he recalls them.

A. You might just as well ask me for any paper that came to the office, if I delivered it to the office, and I would say yes to the best of my recollection.

Q. Your recollection is based on the fact that you would ordinarily do so if you were told to do it?

A. It has been the custom, yes, sir; that was my duty.

100 By Mr. Bick:

Q. You don't know of any deviation from that practice in this case?

A. No, sir.

Q. When did you next see that communication with the first and second endorsement thereon?

A. To the best of my recollection January 21st, 1907.

Q. Where did you see it on that day?

A. Before the third endorsement was put on it I would see it in the secretary's office.

Q. Do you recall how that came into your possession on the 21st of January?

A. To the best of my recollection I went down to the secretary's office and requested it.

Q. What was the condition of the letter and the endorsements after you received them from the secretary's office in reference to their condition at the time you say you brought them down there?

A. The letter and the first and second endorsement was attached and the stamp was on the second endorsement.

Q. And on the letter too?

A. And on the letter too.

Q. I call your attention to the first endorsement, and ask whether you see the impression of the Bliss Company stamp on that?

A. Well, I was looking at it with the glass this morning; it is.

Q. You can see it?

A. Yes, with the glass you can see the impression.

Q. I ask you to use the glass?

A. This glass was furnished me by the district attorney's office; yes, sir, the impression is there on the first endorsement.

Q. When the letter and the endorsements together with the stamp marks were returned to you was there also returned the blue print?

A. No, sir.

101 Q. What then did you do regarding the letter?

A. I typed the third endorsement and pasted it on the top of the second endorsement and left it on Lieutenant Commander McCormick's desk to be signed.

Cross-examination by Mr. Platt:

Q. You were asked by the attorney for the Government when you first saw this letter of January 2nd and the so-called first endorsement?

A. Yes, sir.

Q. I noticed that before answering you stopped and examined the papers carefully; why did you do that?

A. That is to get the date of the second endorsement.

Q. So that you had no separate and independent memory except from the paper itself as to the time when you received it, had you?

A. No, sir, I would have to see the paper to say when it was received.

Q. Is it true that when this letter of January 2nd first came into your possession the endorsement of January 9th was pasted on the letter?

A. To the best of my recollection.

Q. Take the letter in your hand and point out where it was pasted on?

A. The second endorsement. I beg your pardon—I thought you were speaking about the second endorsement; that would be our office endorsement.

Q. I think you stated in answer to counsel's question that you remembered the first endorsement was pasted on the letter?

A. Yes, sir, that is correct.

Q. You remember it was pasted on the letter?

A. Yes, sir.

Q. Whereabouts on the letter was that pasted?

A. On the third fold where my thumb is (indicating).

102 Q. I notice at the top of the third fold there appears in pencil the numbers 20301-3?

A. Yes, sir.

Q. Was it pasted over that?

A. Yes, sir; that is the first time I have seen that number right there.

Q. Do you remember independently that when you received this

paper when it first came into your hand that the first endorsement was pasted on the letter at that point.

A. Yes, I think I can say yes, sir, to that.

Q. What did you do with it when you first received it?

A. I put it on Lieutenant Commander McCormick's desk.

Q. What did you say about copying it?

A. I copied it.

Q. You copied it on the typewriter or press copied it?

A. Copied it on the typewriter, took another piece of paper and copied it.

Q. Copied both the letter and the first endorsement?

A. Yes.

Q. What did you do with those copies?

A. They are in the office files; they were put on the office files.

Q. You have seen them there lately?

A. Yes, sir; I have not seen them lately but I have seen them within six months or so.

Q. Since this case was commenced was your attention called to them and you looked them up?

A. Yes sir, my attention was called to them this morning by the district attorney.

Q. Do you remember the copying of them or do you just merely find the endorsement there and say you copied them from seeing that?

A. I copied them at that time.

Q. Do you remember independently that?

A. Yes, sir, I copied them.

Q. You remember copying this paper?

103 A. Not any more than I would remember copying any other paper that goes through the office if you get down to that.

Q. You don't remember as an independent act the copying of every paper that went through the office?

A. No, sir.

Q. Do you remember independently putting the sheets in the typewriter and going through the act of doing this copying of this particular letter and this endorsement?

A. No, not any particular paper.

Q. In other words, isn't this the case that finding the copy there you assume you did make a copy because you always did make copies?

A. Yes, sir, that has been the custom for me to copy all the papers.

Q. Do you independently remember taking this letter and putting it in Mr. McCormick's basket or on his desk, or do you simply assume you did it because it was your custom?

A. That was my custom to bring the papers to his desk.

Q. Do I understand you to say you wrote out this second endorsement dated January 10th before you put it on his desk?

A. No, sir, I typed it.

Q. You typed it?

A. Yes, sir.

Q. Did he dictate it?

A. No, sir, at that time I didn't take dictation; I made up some of the correspondence and some of it he gave me the pencil memorandum of and I typed it.

Q. Do you remember typing the second one independently or do you just assume you typed it because you see it here?

A. No, sir, I typed it.

Q. You are sure you typed that?

A. Yes, sir.

Q. You remember it?

A. There was no one else to do it.

Q. Do you remember it now as a mental act?

A. Yes, sir.

104 Q. You remember typing the one of January 10th?

A. Yes, sir.

Q. When did you see it next?

A. I have seen that letter a number of times.

Q. When did you see the letter next immediately after typing the second endorsement?

A. January 21st.

Q. After you typed it didn't you take it down stairs?

A. Yes, sir.

Q. To the Bliss Company?

A. Yes, sir.

Q. You saw it then?

A. Yes, sir.

Q. Where did you find it before you took it down?

A. On Lieutenant Commander McCormick's desk.

Q. In the basket on his desk?

A. Yes, sir.

Q. Do you remember that; do you remember getting that letter out of the basket?

A. Yes, sir, that is the way I took all the letters and papers.

Q. What I want you to do is to distinguish between your present memory of having got that paper from the basket and your knowledge of the custom; which is it you are going on in testifying?

A. The custom; it has been the custom; that is what I am saying now.

Q. When you took it do you remember whether you went down stairs in the elevator or down the stairs?

A. I couldn't say whether I walked or went down in the elevator.

Q. Are you sure you didn't hand this to the elevator boy?

A. Positive.

Q. Did you never hand letters to the elevator boy?

A. Never.

Q. Did the elevator boy ever take down letters from Mr. McCormick's office to the Bliss Company's office?

A. Not while I was present.

Q. You never knew of any such custom prevailing?

A. No, sir, not in my presence; if I was out to lunch that might happen.

105 Q. Do you know whether it did happen?

A. No, sir, I don't know of any time like that where a letter was given to the elevator man to leave down stairs.

Q. You don't remember I understood you to say whether you took this to Mr. Seaman's office, personally; you only say that was your custom?

A. Yes sir.

Q. You don't know whether you handed it to Mr. Seaman or laid it on his desk?

A. I can't recall.

Q. Did you ever see the stamp of the Bliss Company, the impression of which appears on that letter of January 2nd?

A. Yes, sir, I have seen it.

Q. I refer to the machine that makes the stamp; have you seen it?

A. Yes, sir.

Q. How often?

A. Pretty near every day.

Q. Where is it; where was it kept at that time?

A. To the best of my recollection it was on the secretary's desk at that time.

Q. On Mr. Seaman's desk?

A. Yes, sir.

Q. In his room?

A. Yes, sir.

Q. You were frequently in there?

A. Yes, sir.

Q. You very often took communications there?

A. I nearly always had to go there once a day any way.

Q. You sometimes took several communications?

A. Yes, sir.

Q. Did you sometimes use that stamp yourself?

A. Yes, sir, with the consent and in the presence of Mr. Seaman.

Q. Did you sometimes put the stamp on the letter which you took down and take it back with you?

A. Yes, sir, with the consent and in the presence of Mr. Seaman.

Q. Have you taken down many hundreds of letters to the office of Mr. Seaman from Mr. McCormick's office?

106 A. I don't know from Mr. McCormick's office, whether there were hundreds in his time, but I have taken down hundreds of letters.

Q. From the government office?

A. Yes, sir.

Q. Which Mr. McCormick occupied, down to the Bliss Company, haven't you, taken many hundred of letters?

A. Yes, sir.

Q. Wasn't it quite a frequent occurrence for you to put the stamp on the letter and carry it back?

A. Not frequent; occasionally.

Q. Sometimes you have done it?

A. I have, yes, sir.

Q. You say that you next saw the letter and the two endorsements on the 21st?

A. Yes, sir, to the best of my recollection.

Q. And your recollection is simply based on the fact that you see it on the paper?

A. Yes, sir.

The Court: We don't know anything about your recollection; if your recollection was good, your recollection might be worth something; if your recollection was very poor it would not be worth anything; that form of expression conveys nothing to us at all; if you know a thing you know it, and if you don't know it you don't.

Q. Do you remember as a mental operation at the present time that you did see that again on the 21st?

A. Yes, sir.

Q. You remember seeing it?

A. Yes, sir, the evidence is there on the endorsement, I seen it.

Q. Do you now remember it or do you just infer it from the fact that you see it on the endorsement?

A. I couldn't say I remember it if the endorsement wasn't on it, no sir.

107 Redirect examination by Mr. Bick:

Q. I show you exhibit-29 and ask you if you know in whose handwriting the name Leavitt is that appears on the upper left hand corner of that letter?

A. All I can say is the word is Leavitt.

Q. Do you know whether that handwriting is yours?

A. No, sir, it is not mine.

Q. Can you tell from your association and experience with Lieutenant McCormick as to whether it is his handwriting?

A. It is not his.

Q. You know that positively?

A. Yes, sir.

108 DELBERT H. DECKER, being duly sworn and examined as a witness for the complainant, testifies as follows:

Direct examination by Mr. Coles:

Q. Will you state your name, age, residence and occupation?

A. Delbert H. Decker, 52 years old, residence Millerton, New York, occupation attorney and counselor at patent law and expert in patent causes.

Q. Please state what educational opportunities and practical experience you have had which tend to enable you to give an opinion as an expert in patent causes?

A. I am a graduate of Cornell-University in the class of 1884, and after graduation I entered the office of a patent attorney in Washington, where I performed the duties of draughtsman and

clerk. In the fall of 1886 I was appointed assistant examiner in the United States Patent Office, where it was my duty to examine applications for patents which required a search through prior patents of the United States and foreign countries and through publications. It also required information of court decisions relative to the validity of patents and relative to their claims. On resignation from the United States patent Office in 1893 I went into the practice of patent law in New York City. I have continued in the practice of patent law since that date. For the past seven years I have given considerable time to the profession of expert in patent litigation.

Q. Have you studied and do you understand the structure and operation of the device disclosed by the United States patent to Davison, No. 858266, which is Exhibit 3?

A. I have studied said patent and understand the operation of the mechanism disclosed therein.

109 Q. Have you studied and are you familiar with the structure of the device or design disclosed by the blue print 117E, which has been marked Exhibit 28?

A. I have studied said blue print and understand the structure disclosed therein.

Q. How does the design disclosed by blueprint 117E marked Exhibit 28 compare with the balanced turbine as shown in the physical embodiment of the torpedo which is marked for identification in this case?

A. The balanced turbine in both instances is the same.

Q. How does the balanced turbine as shown in blue print 117E marked Exhibit 28 compare with the balanced turbine as disclosed in the Davison patent 858266 marked Exhibit 3?

A. The balanced turbine in both these instances is the same.

Q. How does the balanced turbine disclosed in the Davison patent Exhibit 3 compare with the balanced turbine embodied in the present torpedo marked here for identification?

A. The balanced turbine in both of those instances is the same.

Q. In your opinion, based upon your knowledge, qualifications and experience, does the disclosure of the balanced turbine conveyed in the blueprint 117E dominate the structure of the balanced turbine embodied in the torpedo marked here for identification?

A. It is my opinion that it does.

Q. Does the disclosure of the balanced turbine conveyed by the Davison patent marked Exhibit 3 dominate the structure of the balanced turbine embodied in the torpedo here marked for identification?

A. In my opinion it does.

Cross-examination by Mr. Fraser:

Q. How many different constructions do you find shown in the Davison patent Exhibit 3?

110 Objected to as immaterial, because the claims of the patent determine the scope of the patent in view of the structure disclosed therein.

Mr. Fraser: The question asked the witness does not go to the scope of the patent; the question was as to the identity of the structure; we find in the Davison patent certainly more than one construction shown; I want to find on what the witness based his answers.

The Court: You may answer.

A. Before answering that question I would like counsel to make it more definite as to what part of the structure of the Davison patent is referred to by him.

Q. Do you find the same structure of what you call balanced turbine in figure 2 of the patent and figure 3, or different ones?

A. I should not construe the structure of figure 2 of the Davison patent as being that of a balanced turbine, taking the definition of balanced turbine as already used in this case.

Q. What do you mean by balanced turbine?

A. I mean by balanced turbine, and I am applying the term now as heretofore used in this case, to apply to a turbine in which different stages are mounted upon the same axis to rotate in opposite directions, which structure you will find in figure 3 of the Davison patent in the part lettered f and f^1 .

Q. Please explain the operation of those turbines in figure 3?

A. In figure 3 of the Davison patent the part lettered f may be considered as one stage of a turbine; the part f^1 as the second stage of a turbine; the two constitute a balance turbine, one rotating in one direction, we will say clockwise, and the other rotating
111 in the opposite direction, or counterclockwise.

Q. In what sense are they balanced?

A. These two parts, f^1 and f constitute a balanced turbine as we have been treating this mechanism, the one rotating in an opposite direction to the other, counteracting or balancing the tendency to impart rotation to the supporting parts.

Q. To do that must they turn at equal speeds?

A. In the present structure it is essential that they turn at equal speeds.

at the same speed, their weights must be equal.

A. To make a perfectly balanced turbine, both parts running at the same speed, their weights must be equal.

Q. Must their weights be equally distributed?

A. I think not; if the speed multiplied into the weight of the one equals the speed multiplied into the weight of the other, that would be sufficient for balancing them.

Q. You said they must turn at equal speeds and be of equal weights, that being the case, if they are to be balanced must not the weight be distributed the same in both cases?

A. In the present instance I think that would be essential.

Q. Must the wheels be of equal diameter?

A. Not necessarily.

Q. If they are of unequal diameter but of equal weights must there not be a different distribution of weight?

A. That would naturally follow.

Q. What do you understand by the moment of inertia of such a wheel?

A. The moment of inertia of a wheel is that tendency to continue to turn when once set in motion, and is due to its weight and its speed of rotation.

Q. Has the distribution of weight anything to do with the moment of inertia?

A. I am not prepared to say.

112 Q. In the Davison patent I find this expression: "Which consists in so arranging the rotating parts as to cause the moments of inertia in one direction to neutralize the moments of inertia in the opposite direction so that the sum of the moments of inertia of the system shall be zero;" do you understand that expression?

A. I think I do.

Q. Please explain what it means?

A. My understanding of it is that with reference to these wheels, these parts of the turbine f and f^1 , that they revolving in opposite directions about the same axis shall have moments of inertia equal one to the other; that is what I understand Mr. Davison to mean.

Q. Do you understand it to be essential to the structure shown and described in the Davison patent that these moments of inertia in opposite directions shall so neutralize each other that their sum shall be zero?

A. In the structure of figure 3 I consider that statement is true.

Q. Would it be equally true of the other structures shown in that patent?

A. Yes, I should say so, considering figures 9, 7 and 3.

Q. Referring to the blueprint, Exhibit 28, is it true there that the moments of inertia in opposite directions are alike so that their sum is zero?

A. I should say so.

Q. What leads you to think so?

A. From the structure of the parts as here illustrated.

Q. What features of the structure?

A. The two rotors of the turbine bear the same relation to one another as in the Davison patent.

Q. Do you find any differences between the structure or device shown in that blueprint and that shown in figures 3 and 4 of the Davison patent, and if so do you find those differences to be essential differences?

113 A. Figure 4 of the Davison patent does not illustrate the turbine at all.

Q. It illustrates the connecting gearing?

A. I do not consider the connecting gearing as part of the balanced turbine.

Q. You have not answered my question as to figure 3?

A. I find no essential difference between the balanced turbine per se of the blueprint 117E and in figure 3 of the Davison patent.

Q. How about the gearing, is that essentially the same in the two cases?

A. The gearing in the two instances is different; the gearing is simply a means of transmission of the power of the turbine to the propellers, and may be of any form so far as the question relating to the balanced turbine itself is concerned.

Q. Would the gearing in the one instance perform the same function as the gearing in the other instance?

A. The gearing in each instance is intended simply as a means of transmitting the power of the turbine to the propeller, and its function is the same in both instances.

Q. Isn't the gearing exactly the same in both cases except for a slight re-arrangement which does not change its function?

A. There are many minor differences in the transmission gearing, but they do not affect the balanced turbine itself.

Q. That is not the question; the question is, does the gearing in the two cases perform the same function?

Objected to unless it affects the balanced turbine engine.

The Court: He may answer.

Exception.

A. To the extent that it transmits the power from the balanced turbine to the propellers it does.

114 Q. Does the gearing in both instances perform the function of insuring that the oppositely revolving turbines shall maintain their fixed relative speeds?

A. That is true, and yet that does not alter the fact that we have in both instances balanced turbines of the same sort.

Q. Could the turbines be balanced if the gearing did not restrain them to a fixed relative speed?

A. I think they could.

Q. How could they be balanced turbines if the gearing did not restrain them to a certain fixed relative speed?

A. That would be a matter of design, mechanical design.

Q. Do you understand that in the three structures which you have compared, namely, that shown in the Davison patent figure 3, that shown in the drawing Exhibit 28, and that exemplified in the torpedo Exhibit for Identification 27, that the gearing does in each instance restrain the turbines to revolving at a fixed relative speed?

A. The gearing is so constructed as to assure that.

Q. Do you know whether the speeds are alike in all these three instances?

A. There is no way of knowing that.

Q. Do you know whether the two wheels turn at equal speeds in contrary directions in each of the three instances?

A. If you ask me that as a matter of absolute knowledge I shall have to say no.

Q. You have not examined the gearing as to its gearing ratio to determine in either instance whether the counter-speeds are alike, have you?

A. I have not; my examination has been made of the balanced turbine per se in each of the three instances.

Q. Then about as far as your examination has gone you have simply ascertained that the two turbine wheels revolve in opposite directions at somewhere near like speeds, is that it?

115 A. I do not accept that as the conclusion of my efforts in this case.

Q. Please make your own statement of how your conclusion has been reached?

A. I shall have to ask counsel to define what conclusion he wishes to ascertain.

Q. How do you know they are in fact balanced turbines in each of the three instances?

A. I know that in each of the three instances we have a turbine in which there are two rotors revolving—constructed to revolve in opposite directions about the same axis, and that in that respect the three are identical.

Q. Would the turbines be balanced if their moments of inertia were different?

A. No, that would not constitute a balanced turbine.

Q. How do you know the moments of inertia are not different in this turbine and gearing that is here as Exhibit for identification 27?

A. Do you refer to 117E?

Q. The machine itself?

A. I do not know of actual knowledge that they are different; I do know that the turbine of Exhibit 27 is identical with the balanced turbines or with the turbines of the Davison patent and blueprint 117E forming Exhibit 28, in that the parts constituting the turbines are identical.

Q. That is to say, you know that in each of the three cases there are counter-revolution turbines?

A. I do.

Q. But you do not know that in each of the three cases the moments of inertia are neutralized so as to make a balanced turbine?

A. That could be only ascertained from the physical embodiment of the turbine in Exhibit 27, the other being paper 116 exhibit, and I have not ascertained that from that mechanism.

Q. You have not made any measurements or computations with respect to Exhibit 27 in order to enable you to ascertain whether the moments of inertia are equal?

A. I have not.

Q. Then how do you know with respect to that particular structure that the turbines are balanced?

A. The phrase balanced turbine has been used throughout to designate a turbine in which two rotors are on the same axis and revolving in opposite directions; to that extent I call that a balanced turbine.

Q. Without respect to their relative speeds or masses or moments of inertia?

A. Yes.

Q. You said the gearing had nothing to do with it; have you observed that in the Davison patent it is not merely the two tur-

bines that are balanced, but the entire group of mechanism including the turbine and the gearing?

A. I know that is the contention of the assertion of the Davison patent; but in my consideration of the case I have not considered that the different forms of transmission gear affected the broad question of whether or not there was a balanced turbine in the torpedo Exhibit 27 and in the Exhibit blueprint 117E, and in the Davison patent.

Q. Suppose the two turbines in either case were absolutely balanced but the connecting gears was seriously out of balance what would be the effect?

A. As far as the use of the balanced turbine, as far as the question of the use of a balanced turbine in the three instances, it would have no effect; the question as I understand it here is whether or not we have what may be called a balanced turbine in the three instances, the Davison patent, Blueprint 117E and the physical embodiment in the torpedo itself.

117 Q. You think that a serious want of balance in the gearing would not be an effect to be considered?

A. Not when we are considering the identity of the turbine itself in the several instances.

Q. You differ from the statements made by Mr. Davison in his patent that to accomplish the results intended he equalizes the opposite moments of inertia of the respective parts; you consider that unnecessary, do you?

A. As far as this question here is concerned as to whether or not a balanced turbine is used in these three instances.

Q. Apart from your theory as to the negligibility of the balance of the gearing do you know whether as a matter of fact the gearing in the machine Exhibit 27 is balanced or not?

A. From my inspection of the gearing of the machine Exhibit 27 I should say it is balanced.

Q. You believe it is balanced but you do not know it is?

A. Only from what I can see.

Q. You made no measurements or computations?

A. No, sir.

Q. You have not determined whether the opposite moments of inertia are alike?

A. I have made no experiment with the device to make it possible to draw such deduction.

Q. How about the revolving shafts; they turn at pretty high speed, you know that?

A. Yes.

Q. I refer to the propeller shafts?

A. Yes.

Q. Suppose their mass is so different as to create a serious want of balance, would that affect the question as to the structure known as the balanced turbine?

A. Not as I consider the case.

Q. You think if the turbines are balanced it is a matter of indiffer-

ence as to whether other parts geared to them and turned with them are balanced or not?

A. As far as the question involved in this case I do.

118 Q. What do you understand to be the object of balancing the turbines?

A. The object in balancing turbines is to produce a more stable movement of the torpedo.

Q. In what way does the unbalanced turbine produce an unstable movement of the torpedo?

A. Because of the reaction of the motive fluid.

Q. Is that the only reason?

A. That is the chief reason.

Q. Do you know of any other reason?

A. I think that is comprised in my answer, that the reaction is the chief cause.

Q. Please describe what you understand to have been the construction of so-called unbalanced turbines in the torpedoes as made before balanced turbines were introduced?

A. The unbalanced turbine as already defined in this case by a previous witness was one in which the different stages of the turbine rotated in the same direction.

Q. By different stages you mean the different series of buckets?

A. The different series of blades, in the form of turbine under consideration.

Q. Where was that turbine located as you understand it, in the torpedo?

A. It was located with its axis in alignment with that of the propeller shafts, that is to say the turbine was in a plane at right angles to the axis of the propeller shafts.

Q. What do you understand was the effect of the reaction you spoke of?

A. The effect of the reaction at the nozzle would be to tend to rotate the torpedo body itself.

Q. That is to make the torpedo roll?

A. Yes.

Q. Suppose an unbalanced turbine were revolving in a horizontal plane located exactly as in the machine here, Exhibit 27, what then would be the effect of the reaction?

119 A. The effect of the reaction would be to tend to roll the torpedo about its longitudinal axis.

Q. Would it have any other effect?

A. The first tendency would be to make the torpedo swerve about the vertical axis of the turbine, but the resultant effect would be that of causing the torpedo to roll about its longitudinal axis.

Q. Do you know anything about the extent of that rolling tendency in the case of a horizontal turbine as compared with the vertical turbine of the previous construction, both being unbalanced turbines?

A. The difference in effect tending to produce the rolling of the torpedo about its longitudinal axis would depend upon the difference

in distance from that horizontal axis of the point of application of the motive fluid to the turbine.

Q. Please compare that in the two instances; which would be the greater?

A. In the case of the horizontal arrangement of the unbalanced turbine, if the point of application of the motive fluid to the turbine was at the same distance from the longitudinal axis of the torpedo as in the case where the unbalanced turbine was mounted in a plane at right angles to the longitudinal axis of the torpedo and in an alignment therewith, the tendencies to roll the torpedo about its longitudinal axis in both instances would be the same, and the variation in that tendency would be lessened by the distance in location of the turbine when placed in a horizontal plane from the horizontal axis; that is to say if the horizontally located turbine is placed at a distance from the horizontal axis such that the point of application of the motive fluid would be at a less distance from said horizontal axis than in the case of the vertically arranged turbine, then the tendency to roll the torpedo about its longitudinal axis would be lessened.

120 Q. Do you think the rolling effect would be proportional in the two cases to the relative distance from the major horizontal axis of the torpedo to the nozzle?

A. It would, in speaking of the unbalanced turbine.

Q. Then you attribute no effect to the fact that in one instance the turbine revolves in a vertical plane and in the other instance it revolves in a horizontal plane, do you?

A. There might be a slight difference due to the angle of impingement of the motive fluid but none of any great amount.

Q. Do you understand it is an established law of mechanism that action and reaction are equal?

A. I do.

Q. When the impelling effect of the stream of gases upon the turbine wheel is in one direction, say clockwise, is not the reaction in exactly the contrary direction, or counter-clockwise?

A. Yes.

Q. Then if the turbine wheel in one instance is in a vertical plane the counter-reaction is exerted in that same plane isn't it, but in a contrary direction?

A. Yes, generally speaking.

Q. If you turn the turbine into the horizontal plane isn't the reaction then exerted in the horizontal plane in the contrary direction?

A. That would naturally follow.

Q. So that in that case the primary reactive effect is in a direction perpendicular to that of the first instance is it not?

A. Practically; nevertheless in the instance under consideration though the force applied to the reaction in the case of the horizontally arranged turbine is in a horizontal plane, it is acting upon a body free to roll about its longitudinal axis and not at all free to turn about any vertical axis and the resultant would be a rolling action.

Q. Let me ask you to imagine in the machine Exhibit 27 the tur-

121 bine, which may be assumed to be an unbalanced turbine, is lowered so that its center is in a horizontal plane exactly coincident with the major axis of the torpedo; would there then be any rolling effect from the nozzle reaction?

A. There would not.

Q. In what direction then would the nozzle reaction tend to influence the torpedo?

A. To swerve about a vertical axis of the turbine.

Redirect-examination by Mr. Coles:

Q. With reference to the reactive force of the air concerning which you were interrogated, in the form of turbine known as the unbalanced turbine, is the force tending to turn the torpedo around the vertical axis greater or less than the force tending to turn the torpedo around the vertical axis of the balanced type of turbine?

A. It is much greater.

Q. In the balanced type of turbine what is the relation between the reactive force of the air at the nozzle and at the exit?

A. The reaction of the motive fluid at the nozzle and at the exit would be the same.

Adjourned to 10.30 November 12, 1913.

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BROOKLIN, November 12, 1913.

Met pursuant to adjournment as before.

GEORGE W. WILLIAMS, recalled for further examination on behalf of the United States.

By Mr. Coles:

Q. What is that paper which I now hand you?

A. This paper has on it a number of illustrations of ball bearings and one roller bearing, the data for which illustrations were taken from official drawings on file in the drafting room of the Naval Torpedo Station at Newport, Rhode Island; showing the different forms of ball bearings designed at the Naval Torpedo Station between the years 1900 and 1911, with an additional illustration showing the form of ball bearing used in the Bliss-Leavitt gyro, May 14, 1912. There are eleven illustrations in all.

Q. Have you knowledge as to the making of the diagrams shown on that paper, and will you state from what source they were made?

A. These illustrations were prepared at the Naval Torpedo Station by my direction, under the direct supervision of the head draftsman and under my general supervision; they were taken from official drawings and sketches which are in the files of the Naval Torpedo Station.

Mr. Coles: We offer the paper for identification.

The paper is marked Exhibit 40 for identification.

Q. What is this paper which I now hand to you?

A. This paper has on it illustrations, four different forms of air

123 spun gyroscope designed at the Naval Torpedo Station at Newport, Rhode Island, bearing date May 20th, 1901, August, 1902, May 27, 1903, and September 10th, 1904. This is Part 2 of the air spun gyro development.

Q. Was this paper prepared under your supervision, from original drawings on file?

A. This paper was prepared by my direction in obedience to orders from the Bureau of Ordnance in the drafting room at the Naval Torpedo Station at Newport, Rhode Island, from drawings and sketches on file in that drafting room.

The paper is offered for identification.

It is marked Exhibit 41 for identification.

Q. What is this paper which I now hand you?

A. This paper contains illustrations showing three forms of air spun gyro as designed at the Naval Torpedo Station, Newport, Rhode Island, the illustrations being dated May 12th, 1911, December 27th, 1900, and December 17th, 1900, and was illustration of the Bliss-Leavitt Mark 7 gyro, dated August 24th, 1912. This sketch marked Exhibit 40 for identification?

Mr. Coles: I offer the paper for identification.

It is marked Exhibit 42 for identification.

Q. Do the illustrations of gyro mechanism which appear on Parts 1 and 2 show the use of ball bearings and gyro bearings?

A. The illustrations on Part 1 show the use of ball bearings in the gimbal bearings. Exhibit No. 414 for identification, the four illustrations contained therein, show ball bearings.

Q. Is the use of ball bearings and gyro bearings shown on the sketch marked Exhibit 40 for identification?

A. On Exhibit 40 for identification the illustrations are of ball bearings.

124 Q. What is this paper which I now hand you?

A. This paper is marked "Compound reducer development;" it contains four illustrations, three of them dated April the 7th, 1913, May 15th, 1912, and March 3rd, 1913; they are illustrations of designs of compound reducers.

Q. What kind of reducers?

A. Compound reducers.

Q. Reducers of what?

A. Air pressure; they were made at the Naval Torpedo Station, and one illustration of the compound reducer known as Mark 7 modification, one type, dated July 30th, 1913.

Mr. Coles: I offer that paper for identification.

It is marked Exhibit 43 for identification.

Q. Will you please illustrate to the court and indicate the parts on the model of the torpedo Exhibit 27 for identification.

The torpedo is received in evidence as Exhibit 27.

Mr. Fraser: I understand the position of counsel is that this is the torpedo to which our letter of May 9, 1913, relates.

Mr. Coles: We admit that the torpedo is the same as that referred to in the letter of May 9, 1913, so far as the balanced turbine, the ball bearings for the gyro bearings, and the other parts, with the exception of the compound or double air regulator. This particular torpedo which is offered here in evidence was obtained from the Torpedo Station and is one of the earlier Mark 7 torpedoes, into which the double air regulator has not yet been embodied, although the torpedo now being constructed by the defendant
125 for delivery does embody such double air regulator.

Mr. Platt: We accept that statement if you will change it as to "A double air regulator."

Mr. Coles: Yes, a double air regulator.

A. This part of the exhibit in one piece contains what is known as the after body and tail of the 5.2 meter by 45 centimeter Bliss-Leavitt torpedo. This exhibit at its forward end is attached by screws in the manner which is apparent to the after end of the next integral part of the torpedo which is known, generally, as the air flask portion. Attached to the forward end of the air flask portion is that part of the torpedo known as the head, which is generally of an ogival shape, making the whole torpedo to be of the general shape of a cigar. The head, of which there are two forms, contains either water or an explosive charge. The water containing head is known as the exercise head; the explosive containing head is known as the war head. The air flask portion of the torpedo is a steel cylinder with one bulkhead at the forward end, one bulkhead near the after end and one bulkhead at the after end. Between the two forward bulkheads of this steel cylinder is carried a compressed air charge, the air therein being at a pressure of approximately 150 atmospheres. Between the second bulkhead and the after bulkhead is a compartment in which is contained water surrounding a vessel in which is contained alcohol. This part of the exhibit, which I shall mark A-1, which is contained in the after body of the torpedo, is what is generally known as the power plant of the torpedo. It consists of first, what is called a super-heater,
more accurately described by the British as a heater, but
126 which will probably be known in the future as a steam generator. I shall mark it A-2. The next part, immediately before this in the train of action of the torpedo, is what is known as a regulator. It is a reducing valve, for reducing air from the high pressure of the air flask to a uniform comparatively low working pressure. I shall mark it A-3. Immediately following in the course of action of the torpedo is the so-called super-heater, and connected thereto by piping is a nozzle casting which is attached to that part of the exhibit which is marked A-1, the attachment being apparent.

The next part of the mechanism in the course of action of the torpedo is the balanced turbine, which I shall mark A-4. The balanced turbine consists of two turbine wheels, mounted on concentric axles. The next mechanism in the train of action is the gearing and gear spindles, which consist of the spindles, on the upper ends of which are mounted the balanced turbines, carrying spur gears,

which gear into spur gearings on combined spur bevel gear pinions, mounted on athwartship axes, one on each side of the longitudinal center line of the torpedo. The two gearings of this combined gearing are rigidly connected together, and each of the smaller bevel gearing gears into two bevel gears, one forward and one abaft of its axle, inter-connecting the action of the two turbines, balancing the power and communicating it to two concentric shafts to which these last named bevel gears are keyed. These concentric shafts project to the rear, through the after body, into the fourth portion of the torpedo, known as the tail, and carry on their after ends and keyed thereto, two propellers which revolve in opposite directions to each other. The action of the torpedo is as follows: In the train be-

127 between the air flask and the super-heater is a valve known as the starting valve. This valve is the valve which closes off the high pressure air from the rest of the mechanism before the torpedo is fired. There are other valves, but they are opened in preparing the torpedo for firing. At the instant of discharge a projection on the torpedo known as the starting lever, situated in the after body, about half way between the forward and back ends thereof, comes in contact with a projection commonly known as the tripping latch on the tube and throws it to the rear, and through suitable mechanism causes the starting valve to open, admitting air to the reducer. The air passes through the reducer into the so-called super-heater. At the same time that the air enters the super-heater by suitable piping, air is admitted into the chamber before mentioned between the two after bulkheads of the air flask portion of the body, bringing pressure to bear on the liquids contained therein. The piping is so constructed and contains such restrictions as to provide that the air pressure above these liquids is at a slightly higher pressure than that in the super-heater. This is in order to insure that these liquids will feed over. From the bottom of the chamber containing these liquids, pipes lead to the so-called super-heater, and as soon as pressure is admitted, the liquids begin to flow. At the same time and designed to be exactly simultaneous therewith by mechanism actuated by air the so-called super-heater fuse is caused to ignite in the super-heater chamber. The object of this is to ignite the alcohol, which continues to burn as long as the alcohol is fed over. The action of the burning alcohol is to raise the air to a high temperature, thereby increasing the expansive power. Due, however,

128 to limitations in the strength of the material, it is found that greater expansive power can be obtained by the utilizing of the high specific heat of water, which, coming in in a similar manner to the alcohol, is converted into steam, and carries the necessary heat which can be converted into power at a very much lower temperature than if the same amount of heat were put into the air alone. The combined products of combustion, and the steam generated, pass through a pipe and through what is known as nozzles, which is so constructed as to convert the pressure of air into kinetic energy, which impinging upon the buckets of the first stage turbine gives up part of its energy and causes that turbine to revolve. In passing between the buckets of the first stage turbine, the direction

of the air is reversed and strikes upon the buckets of the second stage turbine, which is the upper, causing that to revolve in the opposite direction. I believe that the action of the gearing needs no explanation. It is immaterial what form of gearing is used for the transmission of power. The after body also contains the directive mechanism of the torpedo. The directive mechanism in the line of fire is commonly known as a gyro. The directive mechanism controlling the depth is known as the depth controlling mechanism. The gyro is an application of the principle of the gyroscope. I shall mark this part of the gyro which is commonly known as a gyro—the remaining portion being known as the gyro mechanism—as A-5. The gyro wheel mounted in the double gimbals is caused to revolve at a high rate of rotation. In accordance with the principle of the gyroscope, and neglecting the revolutions of the earth, this wheel preserves its axis in one plane in space, or in a plane parallel thereto, thus establishing a line of reference exactly similar to the magnetic line of the compass. This gyro

129 wheel in its gimbals being free to revolve as far as the torpedo itself is concerned, the torpedo is free to revolve, as far as the gyro wheel is concerned, so that at any time during the run, if the torpedo is deflected from the course on which it is aimed, there will be a movement between the torpedo and the gyro as regards each other, because the gyro wheel is not subject to the movement of the torpedo. This fact is used to produce action on the part of the directive mechanism. In connection with the vertical gimbal of the gyro is a cam plate—I will say that I am not as familiar with the actual details of this gyro, because it is new, but I am simply trying to explain the principle. If as regards the torpedo the gyro wheel moves to one side a certain part of this plate is brought into connection with a vibrating pallet. Dependent upon the relative movements of the torpedo and the gyro wheel, the vibrating pallet is so moved to one side or the other so as to move a valve in one direction or the other. It is so arranged that if the torpedo is deflected to the right, this pallet will move this valve, so as to admit air on one side of a piston which will move the vertical rudder to the left and steer the torpedo back towards its former course. It will probably slightly overrun or be deflected more to the left, but the gyro will then reverse and admit air to the other side of the piston, putting the helm the other way. The torpedo goes down the run in a sinuous curve, passing from one side to the other, the most efficient gyro being one in which the curves are flatter. The wheel of the gyro is given this high rotational movement by a turbine mounted in the gyro mechanism, which actuates a pinion gearing into a pinion on the axle of the gyro wheel. At the moment the starting lever is thrown back, the air flask pressure is thrown
130 through suitable nozzles on this small turbine and in a space of time between 45-100 to 75-100 of a second, spins up and automatically unlocks the gyro from the center position, leaving it free to revolve as regards the torpedo. Contained in the same mechanical unit as the gyro mechanism are certain parts of the depth mechanism. I don't know whether those are pertinent or not.

By Mr. Coles:

Q. Will you explain what has been designated as sheer, by showing the vertical and horizontal rudder action when the torpedo rolls or strikes the water in a heeled condition.

A. The tail of the torpedo, which I will mark A-6, carries what are known as vertical and horizontal rudders. The vertical rudders are subject to the control of the gyroscope mechanism; the horizontal rudders to the control of the depth mechanism. Clearly, their efforts will produce the most efficient results in case they operate in the planes in which they are designed to operate. In the case of torpedoes subject to sheer, which was more characteristic of the 5.2 meter by 45-centimeter Mark 3, Bliss-Leavitt torpedo than any other, it was observed——

Q. State whether that mark was of the balanced or unbalanced type.

A. This torpedo carried a double stage single wheel unbalanced turbine. It was frequently observed during the run of the torpedo, most frequently happening in the first three or four hundred yards, that the torpedo would apparently take rank sheers, usually, if not invariably, to the right. The evidence of this was of course the direction of the wake, and the view was of course fore-shortened. But the wake would appear to make a right angle to the right for a distance of from five to ten or twenty yards, and then a right angle to the left and pursue a more or less straight course to the end of the run. My present idea in regard to that is that it was
131 due to rudder action in wrong planes. If this large rudder known as the horizontal rudder, designed to work in the horizontal plane, should be brought to work in the vertical plane, the torpedo would be deflected from its course, and in the trial with the Mark 3 18-inch torpedo, which is the same as I have mentioned above by another nomenclature, it was noticed that these torpedoes almost uniformly had a heavy heel to the right, while passing from the tube to the water, and would enter the water more or less heeled to the right.

Q. What was the effect of that heeling movement?

A. It would throw the rudders out of the plane in which they were designed to work.

Q. Would it have any effect on the rolling of the torpedo?

A. It would heel the torpedo over to the right; then the torpedo would begin to act as a pendulum; it would roll to the left and then to the right and back again, until the stabilizing force overcame the pendulum force. Rolling records indicate that these rolls continue for a considerable period, depending upon the degree of stability of the torpedo.

Q. How would such rolling or sheering action affect the performance of the torpedo as a weapon of war?

A. It would make it less efficient; it would decrease its accuracy; it would have an effect upon its speed, in that it would have to travel a longer distance. Also every time the rudder goes over the resistance of the torpedo is increased by the fore and aft pressure on the rudder.

Q. You were asked yesterday on cross-examination your view of any torpedo having been built by the Bliss Company for the Government exactly in accordance with blueprint 117-E. State whether the balanced turbine shown in blueprint 117-E has been embodied in any torpedoes made by the Bliss Company for the Government since January, 1907.

A. As far as the turbine itself is concerned, it is essentially the same as that installed in the 5.2 meter by 21-inch Mark 2 and Mark 3 torpedoes. The gearing is different.

Q. What is the advantage of the use of ball bearings in the gyro bearings?

A. The obvious advantage of reducing friction, but peculiarly valuable in the gyro, on account of the extremely delicate balance required for the performance of the gyroscope. One of the facts about the gyroscope is that if a pressure at the end of one of the axes of the gyroscope is applied, acting in one direction, it will produce motion of the mass of the gyroscope in a direction at right angles thereto. Now this pressure might be applied by adding pressure to the end of one of the axes, or the equivalent effect can be obtained by the gyroscope wheel itself being moved one way or the other in the direction of the axis, bringing it out of balance and causing it to depart from the original plane in which it was spun, or a plane parallel thereto. With what were known as pin bearings or cone bearing formerly common, a little play was always necessary in order to prevent the friction in the gyro bearings. At the same time this play had to be restricted to the very smallest necessary amount, in order that the wheel shifting in the direction of the axis would not get out of balance sufficiently to destroy its efficiency. The adjustment was very delicate, and could not be long maintained, and the object for which ball bearings were first put in the gyroscope at the Naval Torpedo Station was for the purpose of eliminating friction while at the same time permitting a stationary and permanent adjustment of the gyroscope wheel as regards movement in the direction of its axis. They were later introduced in the side pivots.

Q. Is the air regulator in the exhibit torpedo here of the single or compound double type?

A. Of the single type.

Q. Do you know whether the Bliss Company has delivered to the Government any of the torpedoes in which the double air regulator has been embodied?

A. I can't be certain of that.

Q. Referring to Exhibit 43 for identification, which was shown you this morning, state whether that discloses the design of double compound air regulator, as developed at the Torpedo Station.

A. It shows three types designed at the Naval Torpedo Station: May 15, 1912, March 3, 1913, and April 7, 1913. The last named being a triple regulator as shown.

Q. Do the torpedoes which are now being constructed by the Bliss Company, but which have not yet been delivered, contain a double or compound air regulator?

A. Such is my impression.

Q. Do you know when the use of the ball bearings and gyro bearings was first installed by the Navy at the Torpedo Station or elsewhere?

A. My first acquaintanceship with ball bearings for gyro bearings was in 1901 at the Naval Torpedo Station.

Mr. Fraser: This testimony is all under the general objection.

Cross-examination by Counsel for the Defendant:

By Mr. Fraser:

Q. Are you familiar with the specifications referred to in the contract of June 12, 1912?

A. I am not.

134 Q. Did you have anything to do with preparing the specifications or preparing the contract?

Objected to as outside of the scope of the direct examination.

A. The Torpedo Station had something to do with them in making certain recommendations in regard thereto. If you will state what particular point you desire to bring out, perhaps I can answer.

Q. I want to bring out whether you know that this torpedo, Exhibit 27, is constructed according to the specifications referred to in that contract.

A. Was the torpedo built under that contract?

Q. That I understand to be admitted.

Mr. Coles: Pardon me. I don't know what your understanding is, but the admission does not go that far, and I object to this cross-examination, because the witness was not asked anything about this in the examination in chief, and it apparently is sought to introduce another contention here which was not developed in the direct examination.

Mr. Fraser: That contract states, your Honor, that the specifications are kept secret in the interest of both the Government and the contractor; but the pleadings contain, I believe, a profert of the specifications, and I call upon defendant's counsel to produce those.

Mr. Coles: Here is the contract; it has been offered in evidence. We offered the contract in evidence. Notwithstanding the fact that counsel has gotten the specifications, I still object to his cross-examination, for the reasons formerly stated.

135 Objection overruled.

Exception.

By Mr. Fraser:

Q. Have you ever seen the drawings of the Bliss-Leavitt torpedo 5.2-meter by 45-centimeter Mark 7?

A. Casually; I have seen them in the drafting room. I have never checked them myself or studied them very closely, but I have seen some of them.

Q. Do those drawings show what you have here called a balanced turbine?

A. I have no distinct recollection of looking at the engine; my understanding is that I would call the turbine installed in that torpedo a balanced turbine. The drawings, as I remember them, are very similar to that torpedo.

Q. As you remember the drawings, they show the turbine as a balanced turbine?

A. They show—as I say, I do not remember looking at the drawing of the engine itself; if it represents that turbine, it represents a balanced turbine.

Q. Do you remember whether in those drawings the gearing is entirely forward near the turbine, or whether a part of it was in the tail of the torpedo?

A. I say I have no distinct recollection of the drawings themselves; but in the Mark 7 torpedo of which this is a type, the gearings are near—there are no stern gearings.

Q. What do you understand to be the principal differences between the Bliss-Leavitt Mark 3 and the Mark 7 torpedoes?

A. Well, the Bliss-Leavitt—you refer to the 18-inch as delivered to the Government. Do you want all the differences?

Q. The principal differences.

A. The principal differences. It contained an inside super-heater so-called as compared with the outside super-heater. There was no provision for water injection into the heated gases. It contained an unbalanced turbine.

136 The Court: That is, the earlier one did?

The Witness: Yes, sir, Mark 3. I am speaking entirely of that now. It contained a different gyro, a different depth mechanism, a different starting mechanism. It was generally different in detail.

Q. As to the unbalanced turbine, how was that located? On what axis?

A. It turned around a horizontal axis, the horizontal, longitudinal axis of the torpedo.

Q. You understand, do you not, that some of the Mark 3 torpedoes had the so-called balanced turbine, but in that same location?

A. Oh, you are speaking of the 21-inch? All the Mark 3 21-inch had the so-called balanced turbine; the only 21-inch torpedoes which had the unbalanced turbine were known as the Mark 1, which was the first fifty of the 5-meter by 21-inch torpedoes delivered by the Bliss Company. The remaining torpedoes of that 300 contract—which I believe was the contract of 1905—were fitted with balanced turbines.

Q. But in all of those torpedoes having balanced turbines, those turned around an axis co-incident with the main axis of the torpedo, did they not?

A. Yes, approximately so.

Q. You said you were familiar with the work in the development of the so-called balanced turbines at Newport?

A. I had knowledge of it, that is, of its being in progress.

Q. Do you know whether during that development there was any change in the turbine itself? That is, in the two turbine wheels?

A. My knowledge was derived from the official reports and in general conversation. If you wish my understanding, I have had no personal knowledge of the development, but I have an understanding of what the facts in the case are, if you desire me to give them.

137 Q. On that understanding, was there any change in the turbine itself?

A. My recollection is that the turbine of the so-called balanced type was obtained by sawing the two stages of the unbalanced turbine apart, and turning the rear stage around for experimental purposes; it was a very crude arrangement.

Q. Was that done by Mr. Davison, and when was it done?

A. It was done at the Torpedo Station in the summer or early spring of 1906.

Q. And by Mr. Davison?

A. Mr. Davison, as I understand it, was the officer in charge of the work; as far as I was concerned, in my official capacity, the active agent of the Bureau in the matter was Commander Albert Gleaves, Mr. Davison being a subordinate of his.

Q. Understanding that the balanced turbine wheels were acquired in that way, do you know of any change that was made in the turbine itself, as apart from the gearing, during that year 1906?

A. I do not believe that there was any actual work done on material in changing the turbines; but I was not at the torpedo station during the whole time, and they didn't report everything they did, so I can't say positively that they did not.

Q. I understood you to say that the officers at the torpedo station were engaged during the summer of 1906, or during the year 1906, in developing the balanced turbine; what part of the balanced turbine were they developing, as far as you know?

A. As I say, my knowledge was received from official reports in the main, and the torpedo station, as I recollect, reported on the trials of the balanced turbine, so-called, in the report, where the wheels revolve in opposite directions exactly as in the present type here, as far as the movement is concerned.

Q. That does not answer my question. In what direction
138 did the development proceed from the first form; was there any change in the turbine wheels themselves, or was the change entirely in the gearing or mounting?

A. We had a number of different types of gearing; the gearing was merely a convenience and a matter of efficiency; it was immaterial as far as the action of the balanced turbine was concerned whether it was driven with a gearing or with a belt. The reactions would still take place, depending, for their amount, upon the mass and speed of the rotating masses.

Q. Well, however that may be, what is your recollection as to whether the development during that year after the first design was in the direction of change in the turbine wheels themselves, or changes in the gearing?

A. The first reports dealt with the trial of this crude device to determine the possibility and the efficiency of the arrangement of turbine wheels turning in opposite directions and transmitting their power with gearing to the propellers. There were several during the summer and fall; they were arranged and drawings made of different arrangements of gearings, for transmitting the power of the turbines to the propellers through the shafting.

Q. Referring to Drawing Exhibit 34, I think you said the 3 right hand views show different designs or different stages of development at the torpedo station. Is that correct?

A. If I said it it was not correct.

Q. Please state the fact.

A. There were different arrangements of the balanced turbine gearing for the transmission of power from the balanced turbine to the shaft.

Q. You identified that drawing. How did you get the dates that are marked on the 3 right hand figures?

A. I compared them with the blue prints which were taken from the original drawings at the torpedo station.

Q. Please examine those 3 right hand figures and tell me whether you find any difference whatever in the turbine wheels themselves in the 3 figures?

A. These are diagrams; they do not represent anything, you know; they are not working drawings; they do not pretend to be accurate. They are undoubtedly different; there is no pretension to mechanical accuracy in these drawings. Comparisons could better be made with the original drawings; I can hunt through here and probably find the discrepancies and differences. In my examination and comparison of them with the original blue prints I did not consider dimensions. In fact the only thing I considered was the method of transmission of power.

Q. As far as the 3 right hand figures indicate, however, you find no difference in the turbine wheels, do you?

A. I have made no such statement.

Q. That is my question; do you find any?

A. On this drawing I do find differences.

Q. What are they?

A. One difference between the 2 upper drawings and the lower drawing is the method of construction of the rear turbine wheel, as shown on this drawing. Whether the section was taken at a different point or not the drawing gives no indication.

Q. Please explain just the difference between the wheels that you have reference to, and state whether it is material or not?

A. No, I don't think it is material. The lower one seems to be more workmanlike than the upper.

Q. Please look at the 3 blue prints, Exhibits 35, 36 and 37, and see whether you find any difference there in the wheels?

A. From just a short examination, as far as I can determine, with the exception of the method of mounting the turbine wheels and the character of the bearings—that is, leaving out that portion of the turbine wheels which is contained

in circles around the center of two inches in diameter, there seems to be no essential difference. The periphery, the driving edges of the wheel, seem to be practically the same.

Q. Then, except in mere mechanical details they are the same, are they not? That is, the principle is precisely the same?

A. Yes, the principle is precisely the same.

Q. So that if there were any development going on at the torpedo station during 1906 that development had to do with the details of gearing and mounting and bearing, and not with the turbine wheels themselves. Is that correct?

A. As far as work on material is concerned I think that is correct; there was quite an amount of study in regard to forms of the buckets, and designs thereof are contained in the files of the torpedo station.

Q. You have referred frequently to what you call the balance turbine. I wish you would state what you consider essential to a balanced turbine?

A. A completely balanced turbine would consist of parts revolving in opposite directions around a concentric axis of exactly the same masses this revolution being produced by any of the various forms of turbine impulse.

Q. You referred in your direct examination to an inside superheater. Please explain what you mean by that?

A. Many of these terms are arbitrarily used either by the E. W. Bliss Company or the Bureau, and are assigned to different parts of the torpedo. The so-called inside superheater was the first form installed in torpedoes for heating the air, in this country, as far as I know. Alcohol was injected into the main body of the air

141 flask itself and ignited at the moment of firing. The temperature of the whole mass of air was raised before proceeding through the piping to the regulator and to the engine. It was known arbitrarily as an inside superheater.

Q. Then the distinction between an inside superheater and an outside superheater is that in the inside superheater the combustion was inside the compressed air flask?

A. Yes.

Q. And in the outside superheater it is exterior to that flask?

A. Yes, sir, the so-called outside superheater was a small vessel through which the air passed, and was heated, in the case of the Bliss Leavitt by alcohol and in the case of the Whitehead torpedo by a form of hydro-carbon.

Q. The superheater in Exhibit 27 that you have described, minutely, is an outside superheater, isn't it?

A. Yes, I would call that outside.

Q. Do you know when the change was made from the inside superheater to the outside superheater?

A. I think in the spring of 1907 was when the first torpedoes came out.

Q. Since that time have any torpedoes been made with the inside superheater?

A. Not to my knowledge.

Q. You would be apt to know if any were made for the Government with an inside superheater, would you not?

A. Well, there has been no general policy of construction; I don't believe there have been; no.

Q. As matter of fact the inside superheater is obsolete as to construction now, is it not?

A. Oh, yes; yes, it is obsolete.

Q. In that inside superheater as actually constructed what parts were placed inside the air flask?

A. What parts were inside the air flask?

Q. Yes; what parts were inside the air flask?

142 A. In one form of inside superheater that I remember there was a pan, an open pan, rather deep, piped from the fuel flask and a long tube containing the firing rod which led down diagonally from the rear end of the flask, and to the bottom of which was attached the igniter and so-called superheater fuse.

Q. As I understand you the alcohol went from an outside vessel through a tube into the heavy compressed air flask, and came up into an open vessel within the flask where it was burned?

A. I wouldn't be certain of the details; that is as I recollect—the alcohol went into the air flask; whether at the bottom or the side I don't recollect.

Q. The alcohol burned right in the main body, in the compressed air?

A. In the compressed air.

Q. And that construction is no longer used, it being now obsolete?

A. No; it was abandoned some time in, I think, 1906.

Adjourned till to-morrow, November 13, at 2 P. M.

143 BROOKLYN, 13 November, 1913. 2 P. M.

Met pursuant to adjournment as before.

GREGORY C. DAVISON, being duly sworn and examined as a witness for the Government, testifies:

By Mr. Coles:

Q. Will you please state your name, age, residence and occupation?

A. My name is G. C. Davison, residence, New London, Connecticut, and occupation engineer.

Q. Are you the same G. C. Davison who obtained United States Patent No. 858,266, issued June 25, 1907?

A. Yes.

Q. Please state when you first conceived the device or design disclosed in that patent?

A. About the month of October in the year 1905.

Q. Where were you at that time and what were your duties?

A. I was on duty as Assistant Inspector of Ordnance at the works of the E. W. Bliss Company at the station Sag Harbor, Long Island, where tests were conducted, and immediately after that went to the torpedo station at Newport, Rhode Island; the exact

date that I went I don't remember, but it was about that time of year.

Q. Were you an officer in the United States Navy?

A. Yes.

Q. When did you enter the Navy?

A. May, 1888.

Q. Are you still in the service?

A. No.

Q. When did you resign?

A. January 1st, 1908.

Q. What was being done at Sag Harbor in the Fall of 1905, at the time you speak of being there?

A. Tests of certain torpedoes, which were built by the
144 Bliss Company for the Government, were being made.

Q. What was the type of engine in those torpedoes?

A. It was turbine.

Q. Was it balanced or unbalanced?

A. Unbalanced.

Q. State what took place later in the Fall of 1905, after you had finished the tests on the unbalanced turbine device which you speak of witnessing at Sag Harbor and after you returned to the Torpedo Station at Newport?

A. At Newport a M 3 Bliss-Leavitt torpedo was fitted up with a ring or weight on one propeller, which would revolve in the direction opposite to that of the turbine. This torpedo was suspended by a ball-bearing from the nose and run to demonstrate that such a weight revolving in opposite directions from the turbine would prevent it from rolling due to the acceleration of the turbine.

Q. Was that Bliss-Leavitt torpedo that was subjected to that test a balanced or unbalanced torpedo?

A. An unbalanced torpedo.

Q. Go ahead and tell what was done?

A. The test was made as described, and it was demonstrated that by having weights revolving in opposite directions with the proper proportions of weight and speed, that you could eliminate the tendency of the torpedo to roll when it was first fired out of the tube, while the turbine was being accelerated.

Q. Had there been a tendency to roll upon these tests that you had witnessed at Sag Harbor?

A. We had been observing this tendency to roll.

Q. What connection did you have at the torpedo station with this work of experimentation with the unbalanced type of torpedo which had been obtained from the Bliss Company?

A. This first experiment that I have just described was
145 simply made at my suggestion; I didn't actually have charge of the work of fitting up the torpedo and conducting the test; I simply suggested the experiments.

Q. Did you have charge of any subsequent work in that connection?

A. After having demonstrated the principle which had been questioned by certain officers, I designed a turbine which would accom-

plish the same purposes by having the moving parts of the turbine revolve in opposite directions, so as to produce the same result that we had with the unbalanced force of inertia. We designed this first and then took a Bliss-Leavitt torpedo and rebuilt the engine part of it, utilizing such parts of the old engine as were available.

Q. Was that Bliss-Leavitt torpedo a balanced or unbalanced torpedo?

A. It was originally unbalanced.

Q. What did you do with it?

A. We arranged some gears so as to cause the two disks carrying the buckets or bucket wheels to revolve in opposite directions instead of revolving in the same direction as they had done theretofore.

Q. Did you make any sketches or drawings showing the progress of this work?

A. I made a sketch myself before any work was done, and this sketch was sent through the official channels to the Bureau of Ordnance.

Q. I call your attention to a sketch, Exhibit 33, which is found at page 56½ of Folio B; this sketch has been put in evidence with the testimony of Captain Gleaves, and identified as having been sent by him to the Bureau with a letter of January 12, 1906.

Mr. Fraser: As this testimony is developing, it relates solely to matters that were done without any notice to the Bliss Company, and long prior to the date of the alleged notice to the Bliss Company given in January, 1907. We therefore object to it on the same grounds as we have to all the previous testimony along this line. We understand that this is all taken subject to the objection and motion to strike out.

The Court: Yes.

Q. Do you recognize that sketch?

A. Yes, I recognize it.

Q. What is it, and who made it, if you know?

A. I made this sketch myself and it was afterwards traced off by one of the draftsman at the Torpedo Station, and this was the sketch I referred to in my previous testimony, which was made before any actual work was done towards the construction of what is known as the balanced turbine torpedoes.

Q. Did you make any calculation in connection with your work in experimenting with this unbalanced turbine, to determine what the moments of inertia were?

A. Yes, these calculations were made for the experiment preceding this, where it was necessary to put a weight on one of the propellers for demonstrating purposes; for this particular design no calculations were necessary, because the two moving parts were virtually the same and moved at practically the same speed so that we didn't have to calculate the moments of inertia.

Q. But you had made calculations prior to that sketch?

A. Yes.

Q. Did you report the results of the calculations to the Department at that time?

A. Yes.

Q. I call your attention to blue prints No. 71 and 76 which appear on page 58 of folio B. What do those blue prints illustrate and whose designs are they?

A. That is, 71 and 76? That is practically the same thing as the one just mentioned, and are a form of balanced turbine torpedoes. They were made by a draftsman under my direction.

Q. Were they made in connection with the developments which we have been speaking about?

A. Yes.

Q. Were they sent to the Department?

A. Why, I don't remember positively whether they were or not; it is very likely they were. I have no recollection about it.

Mr. Coles: I offer in evidence blue prints 71 and 76.

Mr. Fraser: Objected to and we move to strike out all the testimony concerning these exhibits, on the same grounds, that they are incompetent, because preceding any notice given to the defendant.

Same ruling and exception as before.

They are marked respectively Exhibits 44 and 45.

Q. I call your attention to two blue prints which will be found just after page 91 of folio B: what do these blue prints disclose, and under whose direction were they made?

A. These blue prints disclose another arrangement for a balanced turbine, and were made under my direction at the Torpedo Station.

Q. Were they made in connection with the experiments that you have been speaking about?

A. Yes—they were further developments.

Mr. Coles: We offer in evidence the blue prints, the same being 78 and 79, and ask that they be marked Exhibits 46 and 47.

Same objection, ruling and exception.

They are so marked.

148 Q. I now call your attention to a blue print which appears in folio B, just after page 106, and ask you what this blue print discloses and under whose direction it was made?

A. This blue print discloses a design of a balanced turbine and was made under my direction in the course of the work at the Torpedo Station at Newport.

Q. Was it made in connection with the developments of the balanced turbine about which you have been speaking?

A. Yes.

Mr. Coles: I offer in evidence the blue print and ask that it be marked Exhibit 48.

Same objection, ruling and exception.

It is so marked.

Q. I call your attention to blue print which is found just after pages 107 and 108 in folio B. This is known as blue print 117-E

and has been introduced as Exhibit 28. What does that blue print disclose, and under whose direction was it made?

A. That discloses a balanced turbine for torpedoes, and though there are no marks to identify it, it looks familiar. It was probably made under my direction at the Torpedo Station.

Q. Does the design or device disclosed in that blue print 117-E, which is Exhibit 28, illustrate the principle of balanced turbine, according to the disclosure of your patent No. 858,266?

A. Yes.

Q. Will you examine the balanced turbine embodied in the torpedo Exhibit 27, and state whether the balanced turbine embodied in the torpedo is disclosed in blue print 117-E and is so disclosed in your United States Patent?

Mr. Fraser: Objected to as stating a conclusion as not supported by the evidence, and as calling for a conclusion as to the interpretation of the patent that the witness is not shown to be competent to give.

149 Objection overruled.
 Exception.

A. In my opinion the patent covers that turbine.

Mr. Fraser: I move that the answer be stricken out as being a conclusion of law.

The Court: Well, of course it is.

Q. How about the part of the question which asks if the design illustrated in blue print 117-E of the balanced turbine was like the balanced turbine embodied in the torpedo?

A. No, the design is different: the principle is the same.

By the Court:

Q. What did you refer to in your other answer, the design or the principle?

A. The principle is the same.

By Mr. Coles:

Q. In your opinion is the principle of the device disclosed in blue print 117-E as to the balanced turbine the same as the principle of the balanced turbine embodied in the torpedo exhibit?

A. Yes.

Mr. Fraser: Objected to as incompetent and calling for a conclusion, and we move to strike the answer out.

Same ruling and exception as before.

Q. Does the change in the location of the balanced turbine in the body of the torpedo from the vertical to the horizontal plane affect or change the principle of the action of the balanced turbine itself?

Objected to as calling for a mere conclusion.

Same ruling and exception.

150 A. No.

Q. Is the disclosure in your United States patent the same

as that in the English patent No. 22130-A. D. 1907, a copy of which I now hand you?

A. Yes.

Mr. Coles: I now offer in evidence the copy of the English patent and ask that it be marked Exhibit 49.

It is so marked.

Q. It has been shown by the introduction of Exhibits 3 and 4 in this case that the Navy Department acquired from you your United States patent. What disposition did you make of your foreign patent rights in this device that is covered by this United States patent?

A. I disposed of them to the E. W. Bliss Company.

Q. You have stated, in effect, that the experiments at the Torpedo Station in changing the type of turbine from the balanced to the unbalanced, and experimenting with the balanced type of turbine, extended throughout a considerable portion of the year 1906. What was your observation as a result of those experiments, so far as the performance of the balanced type of turbine compared with the previous performance of the unbalanced type?

Mr. Fraser: Same objection as to the previous testimony concerning matters prior to any notice to the defendant.

The Court: Yes, I think you have gone about far enough with that for any purpose for which it could possibly be material.

A. My observation was that the balanced turbine eliminated a certain roll that was shown, which was caused by the unbalanced.

Q. Have you had considerable experience with the use of
151 the unbalanced type?

A. I have had one summer's experience at Sag Harbor, observing the tests.

Q. Prior to this time you have been speaking of now when the development of the balanced turbine was begun by you and going back to the time when the unbalanced turbine was being considered, state if you know who first designed the type of unbalanced turbine which was embodied in the torpedoes used in our Navy?

A. The first turbine which was used by the Navy, so far as I am aware, was designed and built by the E. W. Bliss Company at my suggestion while I was on duty in the Bureau of Ordnance.

Q. When was that?

A. That was in about 1901 or 1902. I left there in 1902.

Q. Was that torpedo one which was bought from the Bliss Company and paid for by the Government?

A. It was not an entire torpedo; it was merely a turbine that was followed later by a torpedo.

Q. Was that the one the Government paid \$3,000 for?

A. I don't know what the Government paid for it; my recollection is they only paid \$600 for the turbine.

Q. You recall that the turbine was bought from the Bliss Company by the Government, do you?

A. Yes.

Q. That is the turbine that you speak of having suggested the design for, yourself, while you were in the Bureau of Ordnance?

A. I didn't suggest the design of the turbine; I simply suggested the use of the turbine. I didn't care anything about the design; I didn't know much about it in those days.

152 Cross-examination by Counsel for the Defendant.

By Mr. Fraser:

Q. Referring to that experimental turbine that was constructed by the E. W. Bliss Company in 1901 or 1902, did you witness any tests of that turbine?

A. Yes.

Q. Where were those tests made?

A. At the works of the E. W. Bliss Company, in Brooklyn.

Q. Will you please describe the construction of that turbine and its gearing?

A. The turbine was of what was commonly called the Curtis type with two rows of moving buckets, with intermediate stationary buckets; a system of gears were employed for reducing the speed to a lower ratio to a single shaft, which in turn was intended to communicate with the propellers.

Q. Was that tested in connection with any torpedo?

A. When I saw it it was installed in an after body, but not hooked up to the propellers and air was derived from an air flask which was supported, and it exhausted out into the atmosphere. In other words, it had not been completely installed for service.

Q. Only enough to make tests on it as a power plant?

A. Yes, and it was connected up to a dynamometer, so that it was possible to measure the output of energy and the consumption of air.

Q. Did you make any dynamometric measurements at that time?

A. Yes.

Q. Did you make a report on the tests of that turbine?

A. Yes.

Q. Will you please refer to folio A, page 15, and state whether you can identify the document which runs from 15 to 25 inclusive, as being your part concerning those tests?

A. Yes, it is.

Q. The two blue prints accompanying that, can you identify those as the ones accompanying the report?

153 those as the ones accompanying the report?

A. Yes.

Mr. Fraser: I ask that these be marked for identification respectively Exhibits 101, 102 and 103.

They are so marked for identification.

Q. Who cooperated with you in making these tests?

A. The Bliss Company.

Q. Do you recall any particular individual?

A. Mr. Leavitt.

Q. Mr. Frank M. Leavitt, the engineer of the company?

A. Yes.

Q. At that time did you have any knowledge of any previous use of a turbine for propelling a torpedo?

A. No.

Q. During those tests did you acquire any knowledge of any previous use of a turbine for that purpose?

A. No.

Q. When you use the expression "balanced turbine," what do you mean?

A. I mean a dynamic balance; that is, the parts rotate in opposite directions and with an equal amount of inertia.

Q. I suppose you mean the same thing that is fully set forth in your patent No. 858,266, do you?

A. Yes.

Q. And in that patent the leading claim expresses it in this way: "A method of compensating torpedoes driven by turbines or other forms of rotary engines or rotary devices, against errors in direction occasioned by gyroscopic action of the rotating parts, which consists in so arranging the rotating parts as to cause the moments of inertia in one direction to neutralize the moments of inertia in the opposite direction, so that the sum of the moments of inertia of the system shall be zero, substantially as described." Does that correctly express the idea of the balanced turbine as you understand it?

A. Yes.

154 Q. That is what you understood you had invented?

A. Yes.

Q. Now, I will ask you, de bene esse as to the experiments that you conducted in Newport during as I understand, 1906. How many different constructions did you make and try there?

A. Three.

Q. In what respect did these differ from one another?

A. The first one didn't modify the turbine itself or the gears in any way, but simply consisted in the attachment of a weight, a fly-wheel on one of the propellers which revolved in opposite directions to the turbine to secure this dynamic balance, which is merely a question of weights of moving parts.

Q. That is the experiment you first described, where you used the unbalanced turbine?

A. Yes.

Q. Now, what is the other one?

A. The second one is the one shown on what they call the blue prints 71 and 76, in which the two bucket wheels are connected by means of bevel gears, so that they will revolve at the same speed in opposite directions. The third form was one in which the bevel gears were eliminated and the proper rotation of the two bucket wheels in opposite directions was secured by means of spur gears.

Q. Have you stated those in the order in which they were built and tested?

A. Yes.

Q. As to the second of those tests, what was the result of the test?

A. The result was that what was known as the roll on launching was eliminated.

Q. Aside from that, what have you to say as to the results of the test as showing the practicability of the construction?

A. That particular construction was merely an improvised one, and those particular bevel gears were not durable. The torpedo was run a number of times and finally the screws broke as they ran at excessive speed.

Q. Was there any trouble with lubrication?

A. No.

Q. As to the third test?

A. The third test showed that it was a practical composition,—the third design.

Q. Will you identify the drawing showing that design?

A. Well, all of these later drawings show practically the same design; there are some minor details; drawing 78, Exhibit 46 and drawing 79, Exhibit 47 show virtually the design and device which proved to be successful.

Q. Referring to this blue print Exhibit 47, does this show gearing gears on axes parallel with the main axis of the propeller shaft and turbines, all the rotating axes being parallel?

A. Yes.

Q. In that respect it resembled the gearing in the Leavitt design unbalanced turbines that you had previously seen tested at Sag Harbor, did it not?

A. Yes.

Q. The only difference, as I understand it, is that you took the second stage turbine wheel and mounted that so that it could turn independently, and then you introduced some idler gears or pinions reversing the motion?

A. Yes.

Q. Otherwise the gearing was exactly the same as in Mr. Leavitt's design?

A. Yes.

Q. And the supporting framework, the general mechanical design was the same?

A. Yes.

Q. In these various different designs that you made during the time you were working with this, or developing this idea at New York, or anywhere else for that matter, did you adhere always to the same idea as to the two oppositely revolving turbine wheels?

A. Yes.

Q. The changes that you made from time to time did not concern the turbine wheels themselves, but the gearings for transmitting motion; is that not correct?

A. That is practically correct. We made a slight change in the second stage buckets, or we wanted to, at least; but it is practically correct, yes.

Q. That is, the second stage turbine went in a contrary direction and the different buckets faced around the opposite way?

A. Yes.

Q. So that the various changes that you made simply concerned the gearing and the bearings and the mechanical details, but didn't affect the principle at all?

A. The principle of what? I don't quite understand.

Q. The principle of operation of the so-called balanced turbine. Is that correct?

A. Yes.

Q. During the Sag Harbor tests in 1906, did you discuss with Mr. Leavitt the proposition of reversing the turbine wheels, or balancing them by counter revolutions?

Objected to.

The Court: Go on.

Exception.

A. In the summer of 1905 Mr. Leavitt and I used to discuss a great many features of the torpedo. He was very interesting to talk to and we were both interested in the subject, and I don't think that this question of balanced turbine ever came up between us. But this question of that roll and the sheer was frequently discussed, and just what we said about it is hard to remember after these years, except I have a very clear recollection of one thing Mr. Leavitt said, and that was that he had an idea that maybe he could get rid of this objectionable action by utilizing his gyroscope. His gyroscope at that time was given its impulse or spin by gear on the main shaft of the torpedo; that is about all I remember as regards any discussion or talk between us; I didn't say anything to Mr. Leavitt about this balancing of the turbine, because in fact I hadn't thought of utilizing the turbine itself for that until after I left
157 Sag Harbor and had severed my connection with the Bliss Company.

Q. Did Mr. Leavitt ever, during any of your discussions tell you that a previous construction of Bliss-Leavitt torpedo with unbalanced turbine propulsion was free from this objectionable roll?

A. He didn't tell me that summer; but later on, after this question of the balanced turbine came up, he did tell me that they had made certain experiments and done certain work with such a turbine.

Q. Did Mr. Leavitt at any time tell you that he had built a torpedo with turbines revolving in opposite directions?

A. He did.

Q. Have you any recollection as to when that was?

A. That was after I had left Sag Harbor and after this question of the balanced turbine had been brought up, and while I was at Newport.

Q. That is, after January, 1907, do you mean?

A. It may have been in the Fall of 1906 or after January, 1907. I can't state positively; it was about that time.

Q. You can't be sure whether it was the time that drawing 117-E was sent to the Bliss Company, or after?

A. My impression is that it was after.

Q. You have identified a British patent taken in your name for what you say is the same invention as the United States patent in

evidence. Do you remember whether any other foreign patents were taken for that same invention?

A. Yes.

Q. Do you recall the countries?

A. I don't know whether I recall all of them; it was England, France, Japan and possibly some other country, but I don't remember.

Q. Those were all assigned by you to the E. W. Bliss Company?

A. Yes.

158 Q. Was that sale by you to the E. W. Bliss Company made with the knowledge of any of your superiors in the Naval service?

Objected to as immaterial.

Objection overruled.

Exception.

A. Yes.

Q. Who was it who knew about that?

A. Admiral Mason, Chief of the Bureau of Ordnance.

Q. You were at that time serving under him?

A. Yes.

Q. Did he know of your having sold this to the E. W. Bliss Company?

Mr. Youngs: Objected to upon the ground that confidential communications between the Commander and his superior officer cannot be stated in this court.

Objection overruled.

Exception.

A. Why, I never had any official information to that effect, but I told him verbally, and also told Captain Gleaves, who was in charge of the Torpedo Station, and whom I was under immediately. There was no secret about it.

Q. Then you sold this invention to the Bliss Company with their knowledge and sanction at that time?

A. Yes.

Redirect examination by counsel for the Government:

By Mr. Coles:

Q. Mr. Davison, on cross examination you spoke of three designs having resulted in the progress of development at Newport in connection with perfecting the balanced turbine, and you stated that blue prints 78 and 79, which are Exhibits 46 and 47, were
159 two of them, and you indicated the third design in that series.

Please state whether blue print 117-E is substantially the same as blue prints 78 and 79 and whether that blue print 117-E is what you meant as the third design?

A. It is.

Q. You spoke on cross examination about changing the second stage wheel of the unbalanced turbine which you were experiment-

ing with at Newport, so as to make it revolve in the opposite direction?

A. Yes.

Q. When you made that change in the development of the balanced turbine from the unbalanced turbine, state if you removed the sector which had been located between the two stages of the wheel in the unbalanced type?

A. We did.

Mr. Fraser: All this line of examination is taken subject to the general objection.

The Court: Yes.

Q. Is that sector which is stationed between the first and second stages of the unbalanced turbine shown in the United States patent to Leavitt, No. 748,759, which I now hand you? If so, please indicate the figure of the patent where it is shown.

A. Yes, it is indicated by the letter F in figure 3 and figure 7.

Q. Does this patent to Leavitt show the unbalanced type of turbine?

A. Yes.

Mr. Coles: I offer in evidence the Leavitt patent. It is marked Exhibit 50.

160 Benjamin McCormick, recalled on behalf of the Government, testifies:

Direct examination by Mr. Coles:

Q. What is this card which I now hand you?

A. It is a card referring to a letter of January 2nd, 1907, of the Naval Torpedo Station, with the endorsement of the Bureau of Ordnance which accompanied the blue print 117-E received in the office of the Inspector of Ordnance of the E. W. Bliss Company; the card was made by me personally on the receipt of that communication, with the enclosure; the subject is the latest design of Davis balanced turbine.

The card is produced to counsel for the defendant.

The Court: Is it part of a card index system?

The Witness: It is a part of a card index system that was in my office at that time.

Mr. Platt: I move to strike out all that the witness said in regard to this card, except the statement that it was a card from his file as incompetent.

The Court: The card speaks for itself, if it goes in evidence; so long as he has stated nothing that does not appear on the card and it is a card that ultimately goes in evidence, I do not see that it does any harm.

Exception.

Q. What were the conditions under which that card was made and what was your purpose in making the memoranda which appear on the card?

Objected to as incompetent, irrelevant and immaterial.

161 Q. Were the entries which appear on this card made by you in the regular course of business as a memorandum at that time, showing what disposition had been made by you as Inspector of Ordnance, of the communications mentioned on the card?

Objected to as incompetent and immaterial.

The Court: No, I think I will take it.

A. Yes.

Mr. Coles: I offer in evidence the card and ask that it be marked Exhibit 51.

Objected to.

The Court: You may cross examine on it before it is put in evidence, Mr. Platt, if you wish.

Mr. Platt: I do not care to cross examine; I haven't anything to ask about it; I don't think it is competent evidence.

The Court: What is this, Mr. McCormick? You say it is pursuant to a system; a system of what? Is it a memorandum of your own?

The Witness: It was a memorandum of my own of the correspondence that went through the office.

Q. Was it made at that time?

A. It was made at the time the correspondence passed through.

Q. Has it been in the files of the office since that time until you received it?

A. To the best of my knowledge it has been in the files of the office since that time; it is an abstract of the letters that passed through.

Objection sustained.

Exception.

162 Mr. Coles: I now again call upon counsel to produce the original letter of March 31, 1906, from the Bureau of Ordnance to the E. W. Bliss Company transmitting two blue prints disclosing a design of ball bearings for gyro bearings.

Mr. Platt: We cannot find this letter anywhere in our files; but the officers of the company say that they remember receiving the letter, therefore, we shall not object to it. We will let the copy that was produced from the Navy Department go in evidence with the blue print.

Mr. Coles: Those are found in folio C, page 48, and the two blue prints are 20,634 and 20,635.

The letter is marked Exhibit 52 and the blue print is marked Exhibit 53.

Q. I now call your attention to a letter dated September 18, 1906, with the endorsements attached thereto, which letter appears pages 69 to 71, folio A. I also call your attention to three blue prints following this letter, being figs. 1, 2 and 3 referred to in said letter and endorsements. Please state—

The Court: What is this now?

Mr. Coles: This is in reference to the superheater. I offer in evidence a certified copy of letter and endorsementns, folio A, pages 69 to 71, with the three blue prints that accompany said letter and endorsements, and ask that same be marked.

The Court: The letter will be marked Exhibit 54, the three blue prints 55, 56 and 57.

Mr. Fraser: We wish to note an objection on the ground
163 of irrelevancy, as these refer to a construction which is now obsolete, and it forms no part of the torpedo in this case.

The Court: Is that admitted?

Mr. Coles: Yes, your Honor, that is admitted. The only purpose of putting the evidence in is to show that notice was given in the manner provided by the contract as to this design which was furnished by the company; and we claim that we are entitled in this injunction to have a clause prohibiting the use of this design in the future.

Q. Mr. McCormick, did you see embodied in any Bliss-Leavit torpedo a superheater of the type disclosed in the design furnished to this company with the letter and endorsements of September 18 1906?

Mr. Platt: Objected to; it cannot be of materiality unless he saw it in the existing type.

Overruled. Exception.

A. I did.

Cross examination by Mr. Fraser:

Q. You have examined those blue prints, showing this construction communicated concerning the superheater, haven't you?

A. I have examined them.

Q. You are familiar with the construction?

A. I am familiar with the construction.

Q. That is applied to the inside superheater, that went inside the air flask?

A. Yes.

Q. That construction is no longer used? It is no part of this torpedo, Exhibit 27?

A. It is no part of this torpedo.

164 ALBERT L. NORTON, called as a witness by the complainant being duly sworn, testified:

Direct examination by Mr. Youngs:

Q. What is your occupation?

A. Naval officer.

Q. What designation?

A. Commander, retired.

Q. Where have you been located the last year or two?

A. On duty, or residence?

Q. On duty where?

A. At the Bureau of Ordnance, Navy Department.

Q. Do you remember that previous to the argument on the order to show cause, the government was requested or directed to produce a certain original letter, which letter bears date January 2, 1907, and is known in this trial as Exhibit No. 29?

A. I know that there was a letter demanded.

Q. Look at this paper which I now show you, and tell me if that is the letter in question?

A. This is a letter of January 2, 1907, from the Naval Torpedo Station to the Bureau of Ordnance.

Q. Did you bring that letter from Washington?

A. Yes, sir.

Q. To the District Attorney's office?

A. Yes, sir.

Q. And on the argument to show cause, was that letter produced in court?

A. Yes, sir.

Q. At the time you found that letter in the files of the Government at Washington, what was its condition as to endorsements?

A. The letter contained the enclosed filmy copy of an endorsement, which is the custom of the Bureau of Ordnance during 1907 to file—

The Court: You were asked its condition.

A. (Cont.) Its condition was as follows: It contained this enclosure. It had on it a first endorsement of January 9, 1907; a second endorsement of January 10, 1907; (I am reading 165 from the original); a third endorsement of January 21, 1907; all attached by means of paste, gum or glue in some manner.

Q. It was not detached from the body of the letter of January 2 in any way, was it?

A. It was not.

Q. And when that was handed to the Court, it was still in the same condition?

A. Yes, sir.

Cross examination by Mr. Platt:

Q. Do you know when those were pasted together?

A. I do not.

Adjourned to Friday, November 14, 1913, 10:30 A. M.

166 BROOKLYN, 14 November, 1913.

Met pursuant to adjournment.

ALBERT L. NORTON, recalled on behalf of the Government, testifies:

Direct examination by Mr. Coles:

Q. How long have you been in the Bureau of Ordnance?

A. Since November 17, 1909.

Q. During the time you have been in the Bureau of Ordnance, have you examined thoroughly the records in the Bureau in relation to the Bliss-Leavitt torpedo and its various parts?

A. I have.

Q. Are you able to state in a general way what the development of the torpedo has been?

A. Yes.

Q. Are you able to state any test upon which these various portions of the torpedo which the Government has mentioned in the Bill were developed?

A. Not accurately from memory, no.

Q. Have you made any memorandum which would refresh your memory on the subject?

A. I have.

Q. When did you make it?

A. In July, 1913, and succeeding dates.

Q. How did you make it?

A. From the files of the Bureau of Ordnance.

Q. From the files of the Bureau of Ordnance did you transcribe the data on to the memorandum?

A. I did.

Q. Have you that memorandum with you?

A. I have.

Q. Please refer to it for the purpose of refreshing your memory.

The Court: He isn't refreshing his memory from his memorandum; his memorandum constitutes his knowledge, doesn't it?

167 A. No, sir, not altogether.

Q. I call your attention to Folio A, marked for identification, pages 82-88 with the blue prints; state what you know with reference to the information the Bureau of Ordnance furnished the defendant relating to a design for a superheater.

By the Court:

Q. Do you get your information from that communication?

A. Necessarily, sir.

The Court: Then it speaks for itself.

Mr. Coles: I offer in evidence certified copy of the letter from the correspondence in Folio A, pages 82-88, and ask that they be marked Exhibit 58, together with the blue prints accompanying it.

The Court: Any particular part of it?

Mr. Coles: The correspondence shows the transmission from the Bureau to the Bliss Company, forwarding the design on the blue print. Page 84 is the Bureau's endorsement forwarding it to the Bliss Company.

Mr. Fraser: If the court please, this communication of March 23, 1908, refers to a blue print of a sketch taken from the *Ravista Maritima Brasileiro*, which I understand to be the Brazilian Maritime Review. It is a printed publication open to the world, and

all the Bureau did was to send it to the defendant, without any notice under Clause 19 of the contract.

The Court: It certainly hasn't got anything to do with the contract. What is the purpose of this? Is it on your claim under the National Defense Act?

168 Mr. Coles: We have stated all along that we claim all of the communications, both those under the contract and those which may not come under the contract, as coming under the provision of the National Defense Act; but this is information which was furnished to the Bliss Company, which was not furnished under the contract; that is, not put under the secrecy clause of the contract.

Mr. Fraser: We object to it for that reason; it has nothing to do with the contract.

The Court: It is admitted that it has nothing to do with the contract. This is part of what the Government claims under the National Defense Act, and in order that the record may show just the nature of such claims I will let it be marked in evidence.

Defendant excepts.

It is marked Exhibit 58.

Q. Does the torpedo exhibit in evidence in this case contain a super-heater embodying the same principle as that disclosed in the design on the blue print which was sent by the Bureau to the Bliss Company with the communications appearing between pages 82 and 88, Folio A?

Mr. Fraser: Objected to on the same grounds, and also as calling for a mere conclusion.

The Court: As at present advised, I do not see anything in it at all; but, so far as I can, without making too voluminous a record here, I want this record to contain all the materials for a final disposition of this entire controversy.

169 Q. How long have you been in the Navy?

A. Since May 23, 1884.

"Q. Does the torpedo exhibit in evidence in this case contain a super-heater embodying the same principle as that disclosed in the design on the blue print which was sent by the Bureau to the Bliss Company with the communications appearing between pages 82 and 88, Folio A?"

By the Court:

Q. Does it embody the structure disclosed by the blue print referred to?

A. Not the structure, no, sir.

By Mr. Coles:

Q. Does it embody the same principle as is disclosed by the blue print?

Objected to as calling for a conclusion.

The Court: Go on.

Exception.

Q. Does it embody the principle?

A. I believe it does, in my opinion.

By Mr. Fraser:

Q. Did Mr. Davison, who was on the stand as a witness for the complainant yesterday, design a super-heater embodying the same principle as the one in the blue print sketch and the one embodied in the torpedo?

Objected to as calling for a conclusion.

The Court: I sustain the objection.

Exception.

Q. Do you know whether the torpedo station designed a super-heater embodying the same principle as the blue print and the torpedo?

170 Same objection.

Objection sustained.

Exception.

Q. Referring now to the item in the bill of complaint entitled "Changes in the location of and area of vertical rudders," I call your attention to letter in Folio A, page 90. State what you know as to any information which the Bureau furnished the Bliss Company with reference to that subject.

Objected to as before, on the ground that no notice is alleged.

The Court: It is admitted that no notice was alleged.

A. This is a copy of a letter to the Bureau of Ordnance mailed to the E. W. Bliss Company through official channels. The letter is dated October 18, 1905.

Mr. Coles: I now desire to offer that letter in evidence.

Mr. Fraser: I should like to ask plaintiff's counsel if it is complainant's contention that the existing type of torpedo contains any balanced rudder.

Mr. Coles: It is not contended that the existing type of torpedo contains a balanced rudder, but it is offered for the purpose of showing that assistance and information with respect to this subject were given to the Bliss Company.

Mr. Fraser: Then it comes under the same objection as to the super-heater as to which the complainant's counsel has admitted that it was obsolete.

The Court: It is received.

Same objection, ruling and exception.

171 It is marked Exhibit 59.

Mr. Coles: I now offer in evidence Folio G, which, by consent of counsel for defendant, being a copy without the seal, is handed in with the understanding that it is the same as the copy which has been furnished to defendant's counsel, which had the seal of the Department on it. They desire to retain their copy with the seal and this is a similar copy.

The Court: Mark it for identification.
It is marked Exhibit G for identification.

Q. I call your attention to a communication found in Folio G at pages 13 to 15. State what you know about that.

Mr. Fraser: We object to these proposed exhibits, because on their face they contain no notice under the contract. Furthermore, they are matters as to which the defendant has had no notice by the pleadings, or the informal Bill of Particulars.

The Court: What does this relate to?

Mr. Coles: The same subject; vertical rudders.

The Court: What is the allegation?

Mr. Coles: Those are letters on defendant's notice or request to have certain information produced.

Mr. Platt: But you don't claim any notice was given?

Mr. Coles: No.

By the Court:

Q. Is the structure disclosed in that communication embodied in the existing type of torpedo in evidence?

A. There is no structure disclosed here; it is simply——

172 Q. Is there anything disclosed in that communication embodied in this existing type of torpedo?

A. I should say yes, in the letter and in the endorsements there are principles or facts disclosed therein which are still applicable to this type of torpedo. I wish to make myself clear. This communication from the Bureau is a warning simply to the company of certain difficulties which the Bureau's representatives in testing had encountered in the use of certain types of rudders and is a warning to them in order that they may profit by the same. That warning would still exist, your Honor, if they use—in other words, if they use the same design that they had in their letter of November 22nd—it would still exist. The location of these rudders is not the same as is referred to in this correspondence. I hope I have made myself clear.

By Mr. Coles:

Q. The Bureau was experiencing difficulty in the action of vertical rudders as embodied in the torpedoes at the time these communications were sent to the company; is that so?

A. The records show it, yes.

Q. And the type of rudders adopted by the Bliss Company, after receipt of these communications, overcame some of the difficulties which were complained of in the communication; is that so?

A. The type of rudder as adopted in the present type of torpedo, from which I can speak from experience, is not the same as referred to in this correspondence, nor is the location the same; but the information which was communicated, as a warning merely of our experience, remains a fact just the same; and that warning was communicated to the company in this letter.

Mr. Fraser: On what the witness has just said, I move
173 that all this testimony concerning this type of rudder and
location of rudder and area of rudders be stricken out, on
the ground that the witness has admitted that it is not embodied in
the existing torpedoes; therefore, it is utterly immaterial to this
action.

The Court: Well, that has happened before; but the Government
contends that outside of the contract, under the provision of the
National Defense Act, as I understand it, everything that they ever
communicated to the defendant with respect to torpedoes, that the dis-
closure of all that, may be enjoined in this case. I will reserve my
opinion on that contention until the evidence and argument are in,
but I am going to give the Government an opportunity to put on
record what their contention would cover, if it were sustained.

Mr. Youngs: I think we would like to make it a little clearer than
that. My contention is that the entire torpedo, the disclosures of it,
every part and parcel of it, is prohibited under the National Defense
Act.

The Court: Well, the principle that I stated will be broad enough
to cover the testimony that you are seeking to put in now, and just
so that we get the explanation in so that all the facts are plain, I
am going to permit you to put on record what this contention would
cover.

Mr. Coles: I now offer in evidence the communication referred to
in pages 13 and 15 of Folio G as Exhibit 60.

Defendant excepts.

The Court: You may have an exception to all this. That
174 relates to the rudder again.

Q. Coming now to the item, "Changes in the method of starting
torpedoes," I call your attention to a letter of April 6, 1907, which
appears at page 9 of Folio G, which I now offer in evidence. State
what you know about that letter?

Same objection, ruling and exception.

The letter is marked Exhibit 61.

A. This is a letter to the Inspector of Ordnance of the E. W. Bliss
Company, directing him to—

The Court: The letter speaks for itself.

A. That is all I have to say; it is a letter to the Inspector of
Ordnance of the E. W. Bliss Company, which left the Bureau, or
was dated April 6, 1907.

Q. Under the item in the complaint, "Change in the type of depth
engine," I call your attention to a letter in Folio G for identification,
page 16, which I offer in evidence. State what you know about that
letter.

Same objection, ruling and exception.

The letter is marked Exhibit 62.

A. This is a letter from the E. W. Bliss Company to the Chief

of the Bureau of Ordnance, bearing date April 28, 1910; this letter was received by the Bureau of Ordnance, according to the records.

Q. I call your attention to a letter on page 17 of Folio G for identification, relating to the same subject matter, which I offer in evidence. State what you know about that letter.

Same objection, ruling and exception.

The letter is marked Exhibit 63.

175 A. This is a letter from the Chief of the Bureau of Ordnance addressed to the E. W. Bliss Company, bearing date March 31, 1910, upon the subject of change in type of depth engine. This letter was replied to by the previous exhibit of April 28, 1910.

Q. I now refer you to page 99 of Folio A for identification. State whether you were a member of the Board which made any report with reference to a change in type of depth engine?

A. I was a member of the Board ordered to report upon certain matters of defective operation, and make recommendation for change in the design of depth engines. This Board met at the works of the E. W. Bliss Company in March, 1910.

Q. Does that letter on page 99 relate in any way to the report of that Board?

A. It does not; it relates to the same subject, but it does not relate to the report of the Board. This letter to which you refer on page 99 is on the subject of bad performance of depth engines; this letter is written from the Naval Torpedo Station, signed by Commander Bristol; it does not refer to the report of the Board, but refers to the same subject.

The letter is offered in evidence.

Same objection, ruling and exception.

Mr. Fraser: We also object to this letter on one other ground, that it contains no evidence of ever having been brought home to the defendant, and is, therefore, incompetent.

Mr. Coles: It is not claimed that it was ever brought to the attention of the Bliss Company.

Objection sustained.

Exception.

176 Q. Was the result of the work which was covered by the report of this Board that you speak of, brought in any way to the attention of the Bliss Company?

A. It was.

Q. How?

A. By a letter from the Bureau of Ordnance advising them of the report of the Board approving the same March 31, 1910; (Exhibit 63).

Q. Did the Bureau develop changes in the curved fire gyro?

Objected to as calling for a conclusion.

Objection sustained.

Exception.

Q. Did the Bureau conduct experiments in developing the curved fire gyro?

Same objection.

Objection sustained.

Exception.

Q. Do you know whether the Bureau ever insisted upon the Bliss Company adopting the principle of the curved fire gyro as developed by the Bureau in connection with the works of the Bliss Company under the contracts with the Bureau?

Same objection, ruling and exception.

Q. Do you know whether the Bliss Company finally yielded to the request of the Bureau to embody the principle of the curved fire gyro in the work which the company was performing under its contracts with the Government?

Mr. Fraser: Objected to. These are all matters of record.

Objection sustained.

Exception.

Q. Do you know of any records which will bear on this subject?

A. I do.

177 Q. Where are they to be found?

A. The requirement for curved fire in gyros is contained in the specifications accompanying or attached or filed, as the case may be, with the contracts of 1905 and 1912; in that they require that the gyro shall be able to control within certain angles. Those are on file.

Q. And those specifications were prepared by the Bureau to meet requirements which the Bureau's experiments had developed as necessary in the operation of the gyro mechanism?

Objected to as incompetent and calling for a conclusion.

Objection sustained.

Exception.

Q. The specifications were prepared by the Bureau, and the Bureau insisted that as to the gyro mechanism, the Bliss Company should make it according to the specifications?

A. With one exception.

Q. What is that?

A. The contract for 100 Mark 6 torpedoes does not contain the requirement for wide angle or curved fire control.

Q. With that exception, do the other contracts contain that requirement?

Mr. Fraser: What contracts are referred to?

Mr. Coles: The contract of 1905, the intermediate contracts, contract of 1912.

Mr. Fraser: Objected to on the ground that the contracts speak for themselves, and the intermediate contracts are not in evidence.

Objection sustained.

Exception.

178 Q. Do the contracts of 1905 and 1912 in the specifications which accompany them require their construction as to the curved fire gyro?

Same objection.

The Court: You may point out the provision, if there is one.

Q. Will you refer to the specifications which accompany those contracts and point out the provision in them which require this construction of curved fire gyro?

A. On page 6 of the specifications for 5-meter by 21-inch Mark 1—

By the Court:

Q. Is it in evidence?

A. It is Exhibit 1 (reading). This is clause 26, page 6 of the specifications:

"Each torpedo attached thereto must be fitted with a horizontal direction regulating device of gyro gear to efficiently direct the course of the torpedo, in accordance with the trial requirements upon any course from directly in the line of the fire to 140 degrees on each side of the line of fire, which shall be so arranged that the course can be set at any instant in either the submerged type or the over water launching type, after the torpedo is loaded in the tube and ready to fire up to the instant of firing, and the gyro gear shall be so arranged that for straight fire in event of its failing to operate, the rudder will not jam in the hard over positions, but will either remain directly free or else be locked within seven degrees of amidships. The vertical rudders——"

This is the same paragraph, your Honor. Shall I continue to read it?

The Court: If it is in response to the question.

The Witness: That is the end, so far as the gyro gear is concerned.

179 Mr. Fraser: We desire now to withdraw our objection to the offer of that 1909 contract.

The Court: Call that contract then of June 16, 1909, Exhibit 2-A.

The Witness: Shall I continue my answer?

The Court: Yes.

A. (continued). The question, as I understand it, referred to two contracts. In the contract of June 12, 1912, page 5 of the specifications, the requirement for gyro gear, clause 23:

"Each torpedo must be fitted with a horizontal direction regulating device or gyro gear to efficiently direct the course of the torpedo. In the shell of the torpedo, visible from the outside, there shall be a gyro index which will indicate in degrees the state of the gyro from zero degrees to one hundred degrees on each side."

This requirement refers to the principle of the wide angle or curved fire in gyros.

By Mr. Coles:

Q. Had the Government worked out the application of that principle in experiments made by the Bureau previous to the preparation of these specifications?

Objected to as calling for a mere conclusion; let him state what anybody did.

Objection sustained.

Exception.

Q. Referring to the item "Changes in independent spin," state what you know about the information obtained by the Department through experiments in connection with this matter, and what, if any such information was communicated to the Bliss Company.

180 Same objection.

By the Court:

Q. Have you got any documents on that?

A. There are reports in the files, of which we have certified copies.

Q. Have you got them here?

A. Yes.

The Court: You may point them out.

Mr. Youngs: That will be in Folio C.

A. The Bureau's files contain reports dated September 30, 1900, "Test of so-called Chambers gyro device."

By Mr. Fraser:

Q. Where is that found.

A. Lieutenant Chandler's report is on page 19 to page 36, Folio C; the Bureau's files further contain a report by then Lieutenant G. W. Williams, dated April 18, 1902, pages 43 and 44, and is again referred to on page 46, April 19, with certain enclosures that follow, without number; one enclosure being page 47. The Bureau's files contain a description of this torpedo as forwarded by the then Lieutenant Commander W. I. Chambers, the first being contained on pages 3 to 10 of the same portfolio, being the date of October 9, 1900; the blue print to illustrate this description follows page 11. A supplementary report from then Lieutenant Chambers is found on pages 13 and 14 of the same portfolio; and the blue print to illustrate the supplementary report follows page 16 of the same portfolio. The blue prints speak for themselves, having the Bureau's numbers.

Q. What is the date of the last one?

A. The supplementary report—I said the blue print followed page 16 and is mentioned in the letter; the blue print is 15598; the letter is dated October 31, 1900, and is from the Chief of the
181 Bureau of Ordnance to the Inspector of Ordnance at the Naval Torpedo Station.

I find no written communication in the files, communicating these devices. The present torpedo contains a gyro spun, in my opinion

similar, if not identical in principle to the types referred to in blue print 15598.

Mr. Fraser: On the witness' admission that he found no communication in this gyro to the defendant, I move to strike out the testimony concerning these devices.

Q. Do you know whether the Bliss Company ever received in any way from the Bureau, or its agents, the information which is covered by the reports and by the blue prints that you were speaking of?

The Court: Of your own knowledge, now.

A. I do not.

Q. Do you know whether the specifications accompanying the contracts of 1905 and 1912 embody the requirements for the construction of the design, of substantially the same principle as that referred to in the reports and in that blue print?

Mr. Fraser: Objected to as calling for a conclusion.

Objection sustained.

Exception.

Q. What difference is there, so far as you know, between the construction referred to in those reports and in the blue print that you have mentioned, and the construction as to the independent spin which is required by the specifications that accompany the contracts of 1905 and 1912?

182 Mr. Fraser: Objected to on the ground that the specifications speak for themselves.

Objection sustained.

Exception.

Q. I call your attention now to Folio D, pages 8 to 11 inclusive, which is a communication from the Bureau of Ordnance, dated January 4, 1913, to the E. W. Bliss Company, and in the latter part of paragraph 6 and in paragraph 9 thereof, on page 11, reference is made to reducing valves and engine regulator. What do you know about this letter?

Mr. Coles: I offer in evidence this letter.

Mr. Fraser: Objected to as containing no communication; it is a mere vague suggestion; it is immaterial.

Mr. Coles: We will follow it up.

The Court: It may be received.

Exception.

It is marked Exhibit 64.

A. This letter was prepared by myself and signed by the Chief of the Bureau of Ordnance: it bears date January 4, 1913, and is in reply to a letter of the E. W. Bliss Company, bearing date December 12, on the subject of dynamometer tests in so far as relates to meeting the requirements of the specifications by the mechanism then installed in the torpedo, the torpedo being the type in evidence.

Mr. Coles: I now offer in evidence letter of January 18, 1913, on page 15 of Folio D.

Q. Did you prepare that letter from the Bureau to the Bliss Company?

A. I did.

Mr. Fraser: The letter is objected to as disclosing no device or design and is, therefore, immaterial.

The Court: That has been the case before.

Exception.

It is marked Exhibit 65.

Mr. Coles: I now desire to offer in evidence the letter from the Bliss Company to the Bureau, dated February 17, 1913, pages 16 and 17 of Folio D.

Same objection, ruling and exception.

It is marked Exhibit 66.

Mr. Coles: I now desire to offer in evidence another letter from the Bliss Company to the Bureau, dated February 18, 1913, on pages 18 and 19 of Folio D. That is on the subject of the double air regulator.

Mr. Fraser: We object to the endorsement of that letter.

Mr. Coles: I think the endorsement should go in that letter; it is a part of the subject matter of the correspondence.

Objection sustained as to the endorsement.

Exception.

Letter is marked Exhibit 67.

Cross-examination by counsel for defendant.

By Mr. Fraser:

Q. I understand that you don't contend that there was any actual disclosure to the defendant of any device for the double regulation of air, do you?

A. I have merely stated facts.

Q. Do you know of any disclosure to the defendant of any device for the double regulation of air?

A. I have had reports of such disclosures, yes.

Q. Do you know it of your own knowledge?

A. I have had reports of that for two years.

Q. Do you know it of your own knowledge?

A. I was not present at any disclosure, nor did I communicate by writing, personally, any letter.

Mr. Fraser: On that answer, I move to strike out the testimony and exhibits relating to the double air regulator.

Mr. Coles: I only asked this witness about the double air regulator so far as the correspondence which he wrote while in the Bureau was concerned. I expect to couple those letters up with the testimony of the Inspector of Ordnance who was on duty at the works of the Bliss Company at that time. He is my next witness.

The Court: Let this go then.

Q. Regarding the independent spin. What do you mean by an independent spin?

A. Of a gyro?

Q. Yes.

A. My conception of an independent spun gyro, or principle of the independent spin, is that embodied in a mechanism whereby the revolutions are imparted to the gyro wheel and its spindles through an independent mechanism or engine, as distinctive, as apart, or distinct from a method of spinning the gyro by impingement of motive fluids on its periphery, as in the case of certain types of gyros known to history.

Q. Then you mean by an independent spin, that it must be an air spin, do you?

A. Not necessarily.

Q. Could it be a spring spin?

A. It has been in the past.

Q. The Obry gear gyroscope used in the old Whitehead torpedo was an independent spring spin, was it not?

A. It was an independent spring spin, yes.

185 Q. Therefore, it was an independent spin; it was independent of the motive power of the torpedo?

A. Yes.

Q. Do you claim that the existing type of Bliss-Leavitt torpedo involves any device for spinning the gyroscope that was communicated by the Bureau of Ordnance to the defendant, to your knowledge?

A. I have stated already in my direct examination that I have no knowledge of such communication from the Bureau.

Q. Now, the angle fire or curved fire gyro, I understand that is for the purpose of enabling the torpedo to be fired at a different angle from that of a line pointing towards the target; is that correct?

A. I don't think your understanding of the matter is correct, if that is what you mean.

Q. What I mean is,—the target you want to hit, is in a certain direction, and you may want to aim it in another direction, and yet have it go to that target?

A. That is correct; that is my understanding.

Q. In a crude way that is what is meant by angle fire or curved fire?

A. I think that explains very well what is meant by curved fire.

Q. Do you claim that that scheme was originated in the Bureau of Ordnance?

A. I have not stated so, sir. We have reports in the Bureau of Ordnance showing the test at the Torpedo Station of a device submitted to the Bureau of Ordnance, all of which is shown in correspondence by Lieutenant W. I. Chambers, embodying the principle of wide angle or curved fire in the gyro.

Mr. Fraser: I move to strike out that evidence because that has been already excluded.

186 Motion granted.

Q. Don't you know as a fact of common knowledge in the literature of the torpedo art, that this angle fire or curved fire is a matter that has been known and discussed for many years with respect to the Whitehead torpedo and other torpedoes of that general type?

A. Do you ask me my general knowledge and reading?

Q. Yes.

A. From my general knowledge and reading of reports I am of the opinion that the Whitehead Torpedo Manufacturing Company had not incorporated curved fire in their gyros up to within the last three or four years: I am indefinite as to the date: it is a quite recent development with them, according to my best knowledge. They do now supply curved fire gyros.

Q. Don't you know that that question of whether the curved fire gyro was desirable or was undesirable had been a matter of common discussion among naval experts for many years?

A. It was a question of discussion. I believe, from my own knowledge, between the naval officers representing the Bureau of Ordnance and the contractors, because I have been present at some of the discussions.

Q. Don't you know that among naval officers in other countries and in naval publications the matter had been generally discussed?

A. I should say that my opinion, formed on that subject was that up to within a few years the United States stood alone in its opinion that curved fire was necessary: I base my opinion on the fact that there was no curve fire to be purchased in commercial torpedoes at that time, so far as I know.

Q. Don't you know that the matter was under discussion abroad and that the Whitehead people had advised against the
187 adoption of this curved fire arrangement?

A. No, I do not, of my own knowledge.

Q. Don't you know it as a matter of common knowledge among naval men, from discussion, and from naval opinions?

A. No I, can't say that I do.

Q. I show you a patent of Leavitt, No. 741683, application for which was filed February 9, 1899, and ask you if you are familiar with this patent: have you ever seen it before?

A. I don't think I have; I may have, in going through the files of the Bureau, run across this patent——

The Court: The question is whether you have, of your own knowledge.

A. No, I have not, so far as I can remember.

FREDERICK L. SAWYER, being duly sworn and examined as a witness for the Government, testifies:

Direct examination by Counsel for the Government:

By Mr. Coles:

Q. When did you enter the Navy?

A. In 1888.

Q. Where were you on duty in January, 1913?

A. I was on duty as Naval Inspector of Ordnance at the works of the E. W. Bliss Company, in Brooklyn, New York.

Q. Do the torpedoes which are now being built by the E. W. Bliss Company, under the contract of 1912, but which have not been yet delivered, contain a double or compound air regulator?

A. They contain a compound regulator.

188 Q. State what, if anything, happened during the time you were on duty at the works of the E. W. Bliss Company with

reference to getting the Bliss Company to adopt the double or compound air regulator?

A. The shop tests of the Mark 7 torpedo required a certain performance in regularity of horse power; the shop tests known as dynamometer tests; when the first of the Mark 7 torpedoes were tested it was found that these torpedoes could practically not meet the specifications as to regularity of horse power. As I recall, there was only one run in very many that fulfilled the specifications. The Company thereupon endeavored to persuade the Bureau of Ordnance to reduce the requirements so that these torpedoes could meet the specifications, as they wished amended. At that time I urged upon the Company the desirability of conducting a test which I informed certain representatives of the Company had been made at the Naval Torpedo Station at Newport, Rhode Island. This experiment had been made in carrying out an invention which was disclosed in a letter written by my assistant, Lieutenant Frederick, on March 9th, 1911, and forwarded by me on March 13, 1911; whereby the inferior performances of certain Bliss-Leavitt torpedoes were shown, due to the irregularity or speed, which defects could be remedied by the use of a compound or triple reducing valve. This letter did not contain a blue print or a drawing, but was sufficiently specific in—

The Court: Where is the letter?

Q. I now hand you Folio D and ask you to indicate the page upon which this letter is?

A. Exhibit D, pages 1-3 inclusive.

Mr. Coles: I ask that that letter be received in evidence.

189 Mr. Fraser: Objected to as incompetent; it is simply a report to the Bureau of Ordnance. There is no evidence that it was ever brought home to the defendant.

Mr. Coles: We expect to show that the subject matter of this letter was communicated verbally to the company, by the witness.

The Court: Well, get to that, then.

Mr. Fraser: We object on the ground that the letter is entirely incompetent.

The Court: The letter is not in; go on.

A. Mr. Leavitt, the engineer of the E. W. Bliss Company, Mr. Page the Vice President of the E. W. Bliss Company, Mr. Flynn, the shop superintendent, and certain employees, were informed—

By Mr. Fraser:

Q. By whom?

A. By me, that tests were made at the Naval Torpedo Station at Newport, using two single regulators arranged in tandem or series, and had been used in dynamometer tests with remarkable increase in efficiency of performance of the torpedo, and that, in my opinion, there would be no difficulty in meeting the requirements of the specifications if they would incorporate this device in the Mark 7 torpedo. There was considerable reluctance on the part of the Company to perform this experiment.

Mr. Fraser: I move to strike out the last statement of the witness.
The Court: Yes. Tell what was said.

By Mr. Coles:

Q. Did the Bliss Company at that time accept your recommendation to embody this double air regulator?

A. They did not, at first.

Q. Did you recommend to the Bureau that the specifications
190 tions be not changed, as requested by the Bliss Company?

Objected to.

Adjourned till Monday, November 17, 1913, at 10 A. M.

BROOKLYN, Nov. 13, 1913

Met pursuant to adjournment, as before.

FREDERICK L. SAWYER, resumes the stand.

By Mr. Coles:

Q. There was a concluding question at the last hearing which the witness has not answered.

The question is read to the witness as follows:

"Q. Did you recommend to the Bureau that the specifications be not changed, as requested by the Bliss Company?"

Mr. Fraser: That question was objected to, and the Court did not rule on the objection. The objection is on the ground that it is incompetent; there is no indication that it was reported to the Bureau, or was in any way brought home to the defendant.

The Court: I will take it subject to connection.

Defendant excepts.

A. I did.

Q. What was your reason for making such recommendation?

Objected to.

The Court: You are getting further and further away; what was done after that?

191 Q. Prior to this time had the plan of using the double air regulator to secure uniformity of horse power throughout the run of the torpedo been tried out?

A. It had at the Naval Torpedo Station at Newport, Rhode Island, by Government officials.

Q. Had you obtained information as a member of any board or otherwise, as to the results which had been attained at Newport in the trial of the use of the double air regulation?

A. I had.

Objected to. The sole question is what did he communicate.

The Court: He says he had. Go on.

Defendant excepts.

Q. Did you communicate to the Bliss Company the information

which you had obtained as to the method and advantages in using the double air regulator to maintain the uniformity or horse power throughout the run of the torpedo?

A. I did.

Q. How did you inform the Bliss Company of this, and to whom did you communicate the information?

A. The information was communicated at various times verbally to the Company's engineer, Mr. Leavitt, the Company's vice-president, Mr. Page, and others, that as a result—

Q. What others do you recall now?

A. The shop superintendent, Mr. John Flynn.

By the Court:

Q. By whom? By you?

A. By me.

By Mr. Coles:

Q. Did the Bliss Company adopt and use the double air regulator after you had communicated the information with respect thereto, which you have just testified about?

A. They did.

Q. Did you subsequently advise the Bureau that the Bliss Company was using a type of air regulator, and did you recommend to the Bureau that notice of secrecy under Clause 20 of the 1912 contract be sent by the Bureau to the Bliss Company?

Objected to.

Objection sustained. It does not make any difference what he communicated to the Bureau.

Complainant excepts.

Q. Did the Bureau notify the Bliss Company in writing that the use by the Company of the double or compound air regulator was regarded as falling under the secrecy clause 20 of the 1912 contract?

A. They did.

Q. Referring to Folio B, page 15, can you identify the letter therein from the Bureau to the Bliss Company dated Jan. 18th, 1913, as the communication through which the notice of secrecy was given by the Bureau to the Bliss Company?

A. Yes; on page 15 a letter of the Bureau dated Jan. 18, 1913—this is a copy of the letter which was delivered to the E. W. Bliss Company.

The letter referred to has been heretofore marked Exhibit 65.

Q. How long were you on duty as inspector of Ordnance with the E. W. Bliss Company?

A. 2 years and 8 months; from Oct., 1910, till July 1st, 1913.

Q. How long were you on duty as inspector of Ordnance with the E. W. Bliss Company?

A. 2 years and 8 months; from Oct., 1910, till July 1st, 1913.

Q. What experience have you had in connection with observing the construction and operation of torpedoes which would enable

you to understand the mechanism of the operating parts embodied in the torpedo?

193 A. I have had experience on ship board in handling torpedoes, and among others experience as Audit Officer of the United States battleship New Jersey; I have had a torpedo course of instruction at the Torpedo Station at Newport, Rhode Island, in 1901; I have been Instructor of Ordnance at the United States Naval Academy, where torpedoes were part of the course of instruction.

Q. What was the date of that?

A. Frm 1901 to 1903; and I was Inspector of Ordnance at the works of the E. W. Bliss Company where all torpedoes of the Bliss-Leavitt type are manufactured.

Q. Did your duties as Inspector of Ordnance at the Bliss Company embrace the close observation of the construction and use of the torpedoes which were being made by the company under contracts with the Government?

A. Yes.

Q. Examine the torpedo, Exhibit 27, and state which type of torpedo it represents?

A. The torpedo on exhibition represents one of the existing type of torpedo, the parts which were inspected by me and which it was a part of my duty to inspect.

Q. What do you mean by the existing type of torpedo?

A. The type of torpedo last built by the E. W. Bliss Company; delivered to the United States Government, and accepted by them.

By the Court:

Q. Under the contract of 1912?

A. Under the contract of 1912.

By Mr. Coles:

Q. Is this torpedo, Exhibit 27, the latest type of torpedo built by the Bliss Company and accepted by the Government?

A. Yes.

194 Q. Does the torpedo, Exhibit 27, correspond in all its essential operating parts to the torpedoes now being built by the Bliss Company for delivery to the Government, with the exception of having a single air regulator instead of a double or compound air regulator?

A. It does in all essential respects.

Q. Had any torpedoes having the double or compound air regulator been delivered by the Bliss Company and accepted by the Government up to May 9, 1913, or up to the time you terminated your duties at the Bliss Company Works, in July, 1913?

A. There had not.

Q. While you were on duty at the works of the Bliss Company did said company build any torpedoes of the existing type in excess of the number required by the contract?

A. Yes.

Q. How many?

A. Two torpedoes of the same type were built by the company for their own use in carrying out tests.

Q. Did those two additional torpedoes have the balanced turbine embodied in them?

A. They did.

Q. Were they essentially the same as to operating parts as the torpedo, Exhibit 27, or the existing type?

Mr. Fraser: Objected to unless the witness knows of his own knowledge what is in them.

The Court: Yes; you are testifying of your own knowledge.

A. Of my own knowledge they were practically identical as to balanced turbine, motive power, gyros, and in fact all operative parts.

Q. Were they built so that the operative parts were what is called interchangeable?

A. Substantially, yes.

Q. Were all the torpedoes being built by the Bliss Company for the United States on May 9, 1913, of the same type as the 195 torpedo, Exhibit 27, the existing type of torpedo, except for variation in size and dimensions?

A. They were, most parts of the motive power and control being interchangeable between the different sizes.

Q. Are the balanced turbine itself, the superheater, the ball bearings and gyroscope, all the other parts embodied in torpedo Exhibit 27 except the air regulator, of the same type as those parts embodied in the torpedoes now being built by the Bliss Company for the Government, which have not yet been delivered?

A. Yes, they are alike, and the parts are interchangeable.

Q. Do you recall having any conversation with any officer of the Bliss Company with respect to the rights of the United States in and to the structure covered by the Davison patent, Exhibit 3?

A. Yes, I recall that on December 24th, 1912, in conversation with the company's vice-president, Mr. Page, on the subject of efforts then being made by the Government to prevent the exportation of the Bliss-Leavitt type torpedo abroad for extradition purposes, that Mr. Page stated that the balanced turbine fell under the patent held by the United States Government, as far as building it in the United States was concerned.

Cross-examined by Counsel for the Defendant:

By Mr. Fraser:

Q. How many different times did you talk with Mr. Leavitt about the proposed double regulation or compound regulation of air?

A. I cannot say.

Q. More than once?

A. Yes.

Q. Just what, in substance, did you tell him?

A. In substance I told him that the difficulty in meeting the

196 specifications in regard to the uniformity of horse power, could in all probability be overcome by using a compound or 2-stage regulator; that following the recommendation of Lieutenant Frederick, the Naval Torpedo Station at Newport had performed the experiment of using two regulators in tandem, or series, with a Bliss-Leavitt Mark 2 Torpedo, with a consequent remarkable improvement in the uniformity of the horse power, and that if they would repeat the same experiment, using two single regulators of the type in the existing torpedo, shown in Exhibit 27, they would no doubt accomplish the desired result of obtaining greater uniformity of horse power out of it.

Q. Did you tell him whether that test at Newport was a dynamometer test, or an actual run?

Objected to as immaterial.

Objection overruled.

Exception.

A. To the best of my recollection I told him that it was a dynamometer test; the test actually made was a dynamometer test.

Q. Please explain the difference between the dynamometer test and a test in actual performance?

A. In a dynamometer test, which is a shop test, the propellers are removed from the torpedo, and an arrangement for calibrating the horse power is substituted.

Q. Did Mr. Leavitt ask you to give him a design for the double air regulation?

A. I do not recall that he did.

Q. Did he ask you if you had a design?

A. I do not recall that he did.

Q. As a matter of fact you did not give him any design, did you?

A. No, no design was given him so far as blue prints or written descriptions were concerned.

197 Q. The correspondence indicates that all you did was to give him orally the idea of using two such regulating valves in series; that is all you told him, isn't it, about the construction?

A. Substantially the information was explaining to him the experiment outlined above.

Q. That isn't the point. Did you go any further towards telling him how to carry out the mechanical construction in the torpedo, than to tell him to use two of the existing regulating valves connected in series?

A. Yes, there were numerous discussions as to the practical means of using a compound regulator in the particular type of torpedo shown in the exhibit here (Exhibit 27), the sole question practically reducing itself to whether or not they had a sufficient space to apply this design, or principle.

Q. Were those discussions with both Mr. Leavitt and Mr. Page?

A. Sometimes with one, and some times with the other; sometimes with both.

Q. And they both made the same objection, that there was diffi-

culty in getting two valves into the space previously occupied by one; is that right?

A. Not exactly; they considered that the space was so limited that there would be difficulty in fitting the compound regulator, or two regulators in the space for this type of torpedo shown here.

Q. Did they ask you if you could supply them a design whereby the two valves could be fitted in that limited space?

A. As I recall they did not ask me for a design so far as preparing a blue print or working drawing was concerned; but my claim was that there was sufficient space, which they at first said they did not think was possible.

Q. Did they also object that the addition of another valve would increase the weight of the torpedo beyond the limit that was prescribed?

A. Yes, they urged this as an objection, and as a matter of fact the design which they finally worked out to fit the space, required a few more pounds; I think about 4½ pounds.

Q. How did you meet their objection as to the increase in weight?

A. I told them that I had no doubt that the Government would sufficiently modify the specifications as to allow this slight additional weight in order to obtain the marked improvements which would thereby be obtained for the torpedo.

Q. You referred a moment ago to the design which they finally worked out. Who worked out that design, if you know?

A. The particular design for this torpedo on exhibit was, I think, first suggested by one of their draftsmen.

Q. This torpedo on exhibit has not the double regulating valves. Who was it that worked out the design by which they were enabled to introduce the double regulating valves, if you know?

A. I am unable to say that it was any particular individual's design; I believe it was not; I believe that it was the result of collaboration on the part of a number of the company's officials or employees.

Q. Did you know at the time of the discussions referred to that double regulating valves for reducing air pressure, or gas pressure, were a very old thing in automobile torpedoes?

Mr. Coles: Objected to as immaterial; it not having been shown that there was any earlier use of those air regulators.

The Court: He may answer.

Exception.

The question is read to the witness.

A. I did not know that they were a very old design, but subsequent to the disclosure of the design by Lieutenant Frederick I had learned through reports from the office of Naval Intelligence that compound regulation was being developed or used abroad.

Q. Was anything said in those interviews between yourself and Mr. Page or Mr. Leavitt, or both, as to fact that the using of two valves to give what you call compound regulation of air, was itself a very obvious thing?

A. I do not recall such conversation.

Q. Didn't Mr. Leavitt tell you, in substance that the use of two such valves was about the most obvious thing that would naturally occur to anyone for accomplishing that result, and that the only difficulty was to get two such valves into the contracted space afforded by this torpedo?

A. I do not recall the above alleged remarks, but at or about this time I do recall that Mr. Leavitt was endeavoring to accomplish a similar result by an entirely different design of valve, from which I infer that he was not familiar with the principle of compound regulation, so far as applied to a torpedo.

Q. You knew at the time that pressure regulating valves for reducing pressure were very common in the arts generally, didn't you?

A. Yes.

Q. You knew that Mr. Leavitt and Mr. Page knew that, didn't you?

A. Yes, doubtless they were familiar with the state of the art so far as commercial purposes were concerned.

Q. By double or compound regulation you mean the application of a first valve to reduce from the high pressure in the compressed air flask to an intermediate pressure, and then a second valve to reduce from that intermediate pressure to the engine pressure, do you not?

A. That is substantially the definition, except that the second pressure reduces you to the super-heater pressure, as the engine pressure cannot be so closely defined in a turbine.

200 Q. With that slight correction the definition is correct, is it?

A. Yes.

Q. The distinction you make is between the pressure in the super-heater and the pressure on delivery to the engine, as distinguished from the pressure on delivery to the nozzle of the turbine engine?

A. The distinction I meant to convey was that the pressure upon actual delivery to the turbine as in the exhibit, balanced turbine, is difficult of determination except at the exact points where the pressure is measured.

ARTHUR CURTIS STOTT, being duly sworn and examined as a witness for the Government, testifies:

Direct examination by Mr. Coles:

Q. Will you give your name, age, residence and occupation?

A. Lieutenant in the United States Navy, age 30 years, at present attached to the works of the E. W. Bliss Company as assistant to the Naval Inspector of Ordnance.

Q. How long have you been on duty at the works of the Bliss Company as first assistant Inspector of Ordnance or otherwise?

A. I have been on duty there as assistant Inspector of Ordnance since August, 1912.

Q. Were you there during part of the tour of duty of Commander Sawyer, who has just testified?

A. Yes, sir, during the last part of his tour of duty.

Q. Do you recall any conversation with any officials of the E. W. Bliss Company as to the question of the balanced turbine as embodied in the Bliss-Leavitt torpedo, falling under the patent to Davison, Exhibit 3? If so, state who was present and what the conversation was.

A. I recall a conversation which took place on December 201 24th, 1912, between Commander Sawyer and Mr. Page, and the conversation came up in connection with the exhibition of the Bliss-Leavitt torpedo abroad. Captain Sawyer had gone to Mr. Page to find out the intentions of the E. W. Bliss Company in connection with making this exhibition abroad, and Mr. Page, during the course of the conversation, stated that the Bliss Company recognized the rights in the United States of the Government to the balanced turbine, but he also stated that if the company wished to build all that torpedo except the turbine in this country, they could take that much of it abroad, and that he believed there was nothing to prevent their building the turbines in the Bliss Company's Paris or London shops.

Q. Building those balanced turbines in Paris and London shops of the Bliss Company from what information?

A. Presumably from the information they already had; but that didn't enter into the conversation.

Q. From plans or working drawings?

A. That must have been understood, yes.

Q. Has the Bliss Company built any torpedoes embodying the balanced turbine in addition to the number of torpedoes which were covered by the contract with the Government, under which it was constructing them?

A. They haven't built any during my tour of duty at the works. I know that they have two which are not embodied in the *the* contract. I know that because I have seen the torpedoes and I have been in communication recently with the Assistant Inspector at Sag Harbor in connection with one of them.

Q. When you said they had built two not covered by the 202 contract, did you mean two in addition to the contract number?

A. There are two now in existence for which there are no contracts; they were not built during my time at the works.

Q. Do those two additional torpedoes, outside of the number required by the contract, embody a balanced turbine engine?

A. Yes, they do.

Q. How does that balanced turbine engine compare with the balanced turbine engine embodied in the torpedo, Exhibit 27?

A. It is identical with it and has been interchanged.

Cross-examination by counsel for defendant:

By Mr. Platt:

Q. Was this conversation that you had with Mr. Page the only conversation you had with him on the subject?

A. The conversation to which I just referred was not with me; it was with Commander Sawyer.

Q. You were present?

A. I was present, yes, sir.

Q. It was on the 24th of December, 1912?

A. Yes.

Q. Where did it take place?

A. In Mr. Page's office in the Bliss Company.

Q. How do you fix the date?

A. I remember we wished Mr. Page a merry Christmas as we went out; it was the day before the holiday.

Q. What did Mr. Page say?

A. I don't remember his exact words, but the substance of his conversation was as I have just stated.

Q. Well, say it over.

A. He stated that he recognized the rights of the United States Government to the American patent on the balanced turbine; but that, as he understood it, there was nothing to prevent the Bliss Company building the torpedoes here, except for the balanced turbine, taking them abroad, and then building turbines in their foreign shops.

203 Mr. Coles: We rest our case in chief at this point.

Mr. Fraser: We renew now the motion that we made at the close of the opening argument, that that portion of the Bill of Complaint be dismissed, which rests upon the National Defense Act.

The Court: I think we will proceed now with your evidence as to the matters on which it is claimed by the company that they have acted under the contract, and then I will consider your motion when you rest.

204 *Testimony for the Defendant.*

FRANK C. B. PAGE, being duly sworn and examined as a witness for the defendant, testifies:

Direct examination by Mr. Platt:

Q. Are you the vice-president of the defendant, the E. W. Bliss Company?

A. I am.

Q. How long have you been vice-president of the company?

A. I have been vice-president of the company since October 22, 1905.

Q. Before that were you with the company?

A. I was with the company for a great many years before that; since 1885.

Q. Have you had the principal part of the business for the company in negotiating and making contracts for Bliss-Leavitt torpedoes for the United States Government?

A. I have.

Q. What is the business, in a general way, of the Bliss Company?

A. The Bliss Company has its main works at the foot of Adams Street.

Q. In Brooklyn?

A. In Brooklyn. It has other works in South Brooklyn and works in Paris and London. For the making of a general line of sheet metal working machinery, as well as special machinery, and also for the manufacture of torpedoes and other ordnance material.

Q. For the United States Government?

A. For the United States Government.

Q. How long has the Bliss Company been making torpedoes for the United States Government?

A. Prior to 1903 the United States Government used Whitehead torpedoes.

Q. Did the Bliss Company make the Whitehead torpedoes for the United States Government before 1903?

A. Yes.

Q. For how long?

A. About twelve years, I should say.

205 Q. Were those made under contracts between the Bliss Company and the Government, or between the Bliss Company and the Whitehead Company?

Mr. Youngs: Objected to as immaterial and irrelevant.

The Court: I suppose it is explanatory of the subject. I don't know what relevancy it has, but go on.

Complainant excepts.

A. (Continued:) The torpedoes were made in the works of the E. W. Bliss Company for the United States Government under an arrangement between the Bliss Company and the Whitehead Company.

Q. Will you describe briefly what was the type or character and the principal features of the Whitehead torpedoes as distinguished from the Bliss-Leavitt torpedo?

A. The Whitehead torpedo was a torpedo of the same general character as the Bliss-Leavitt torpedo. The main features which would characterize the Bliss-Leavitt torpedo from the Whitehead torpedo are the turbine engines for furnishing the power for driving the torpedo, as against the reciprocating engine used by the Whitehead people; a super-heating device for heating the compressed air in the Bliss-Leavitt torpedo, which enables the torpedo to travel over a range probably six times that of the Whitehead, which used cold air; also, the use in the Bliss-Leavitt torpedo of an improved gyroscope which operated the valves for controlling the vertical rudders by means of a device which brought practically no load on the gimbal of the gyro, as against a valve in the Whitehead which was actuated directly from the gimbal. There are many other details of construction which are different, but those three I think can
206 be considered the real essentials.

The Court: Is there any claim on the part of the Government that the Government itself stands in a different position with respect to

the application of the doctrine of waiver from that in which an individual would stand?

Mr. Coles: May it please the court, according to the position of the Government's counsel in this case, the doctrine of waiver has no application here.

The Court: Well, assume that it has.

Mr. Coles: If there were any question of waiver in this case outside of any application of the National Defense Act, then, as far as I understand it, the position of the Government as to that question of waiver, if it were present, would be substantially what the individual's position would be.

Adjourned for recess till 2 P. M.

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2 P. M., NOVEMBER 17, 1913.

The examination of the witness Page is suspended for the purpose of calling Arthur S. Browne.

ARTHUR S. BROWNE, being called and sworn as a witness for the defendant, testifies:

Direct examination by Mr. Fraser:

Q. Where do you reside?

A. Chevy Chase, Maryland.

Q. What is your occupation?

A. Patent solicitor and expert.

Q. How long have you been engaged in that profession?

A. Over thirty years.

Q. In the course of your experience have you given testimony as an expert in cases in the United States Courts?

A. A great many times; I should say in over four hundred patent suits.

Q. Have you ever testified in any cases involving the construction of torpedoes, automobile torpedoes, or cases involving gyroscopes?

A. Yes; I testified in a suit brought by the Howell Torpedo Company against the E. W. Bliss Company, in this Court thirteen years ago, and that suit involved a torpedo made at that time by the E. W. Bliss Company, the Whitehead torpedo.

Mr. Coles: I object to the last part of the answer and ask that it be stricken out.

The Court: Strike it out.

Exception.

Q. You were in court and heard the testimony of Commander Williams describing the torpedo, Exhibit 27, which is here in court?

A. Yes.

208 Q. You have been in court and heard considerable testimony concerning the so-called balanced turbine torpedo?

A. Yes.

Q. Have you given any study or attention to the structure known as a turbine?

A. I have.

Q. I show you the patent of Curtis, No. 566,968, dated September 1, 1896, and direct your attention particularly to figure 11; describe the construction shown in that figure from the specification.

Mr. Youngs: I object as incompetent, irrelevant and immaterial. The Court: I will take it subject to a motion to strike out.

A. This Curtis patent is for elastic fluid turbine and in the first figure of the drawings it illustrates a turbine wheel which rotates only in one direction. But in figure 11 it illustrates a turbine having two wheels which rotate in opposite directions. The specification says, beginning at line 70 of page 3: "and Fig. 11 is a vertical section on the same scale as Fig. 1, showing an apparatus with oppositely-rotating sets of movable vanes and without stationary intermediate passages." A further description begins on line 59, page 8: "Besides the forms of apparatus which have been described, many features of my invention are involved in the construction and operation of such an apparatus as that shown in Fig. 11, in which only movable vanes are employed in the working part of the apparatus, the sets of vanes being alternately mounted upon oppositely-rotating disks and delivering the fluid-jet from one set of movable vanes directly to another set without the interposition of stationary passages. It will be understood that the movable vanes have all the characteristics of the movable vanes already described, but
209 "that those on one disk are set or curved oppositely to those
"on the other disk. In the apparatus Fig. 11, the expanding-nozzle is designed to convert all or the larger portion of the useful pressure into vis viva, although the overlapping of the operations of converting pressure into vis vi-a and vis viva into mechanical power can likewise be employed in an apparatus of this kind." This patent illustrates and describes a turbine having two wheels which rotate in opposite directions. In Figure 11 of this copy the different parts are colored red and blue to indicate the oppositely moving parts.

Mr. Coles: I move to strike out the answer as incompetent, irrelevant and immaterial.

The Court: I will reserve ruling.

Mr. Coles: We request the right to reserve exception to your Honor's ruling when made.

Mr. Fraser: I offer that patent in evidence.

The patent is marked defendant's Exhibit 104.

Q. I show you now copy of a patent to Parsons, No. 729,215, May 26, 1903, and ask you if you find in that any counter-revolution turbine; if so, please explain it and state for what use it is illustrated.

A. This patent of Parsons is for a steam turbine in which there are two turbine wheels which rotate in opposite directions; and in figures 2 and 3 of the drawings this organization is illustrated in connection with driving a boat.

By the Court:

Q. Is that the well-known Parsons turbine?

A. That is by the inventor of the well-known turbine.
210 This specification, line 7, page 2, says: "In some cases I may
" use concentric or hollow shafts and mount the armature and
" field magnets, respectively, on the two members. Any suitable
" method may be adopted for governing. When used for marine
" propulsion (see Fig. 2), I preferably use concentric shafts, such as
" *r s*, and mount on each one or more propellers, or bow and stern
" screws may be employed. A suitable arrangement of propeller is
" shown in Fig. 3, the outer shaft being fitted with left-handed pro-
" pellers and the inner shaft with right-hand ones." This thus
shows the application of turbine wheels rotating in opposite directions
for propelling a boat.

Mr. Fraser: I offer that patent in evidence.

The patent is marked Defendant's Exhibit 105.

Q. I now show you a copy of a British patent to De Ferranti,
No. 9496, of 1904, and ask you whether you find in that any illus-
tration and description of a counter-revolution turbine and if so, to
what purpose is it applied?

A. This De Ferranti British patent is for improvements in and
relating to turbine installations for propulsive purposes, and it shows
oppositely rotating turbine wheels for driving a torpedo. The speci-
fications says, beginning at line 18, page 1: "According to my in-
" vention, I construct torpedoes of the Whitehead type, and instead
" of fitting them with engines, as at present, I supply the motive
" power by means of two opposite running impact multiple reaction
" wheels of any known type which run screws without intermediate
" gearing in opposite directions on two concentric shafts." This
construction is illustrated in Fig. 1-A of the drawings which
211 shows the two oppositely rotating turbine wheels running sep-
arate shafts for driving the torpedo.

Mr. Fraser: I offer this De Ferranti patent in evidence.

The patent is marked Defendant's Exhibit 106.

Q. I now call your attention to the Davison patent, Exhibit 3,
and ask you to compare generally the construction shown in that
patent with reference particularly to Figure 3, and the succeeding
figures, with what is contained in those portions of the Curtis, Par-
sons and De Ferranti patents that you have just explained.

Mr. Coles: I object on the same ground as before stated.

The Court: The same ruling.

A. The structure of the Davison patent is similar to the con-
structions of the Curtis, Parsons and De Ferranti patents in that
it, like them, has two oppositely rotating turbine wheels. The dif-
ference is that Davison has intermediate gearing, operated by these
two turbine wheels, so that, through that gearing, both turbine wheels
rotate the same single shaft in the same direction. That single
shaft is utilized to rotate propellers in opposite directions by means
of additional gearing in the tail of the torpedo. On the other hand
in the Parsons and De Ferranti patents, the two turbine wheels

rotate two different shafts in opposite directions, and there is no intermediate gearing between the wheels and the shafts. Accordingly the important difference between the Davison and the Curtis, Parsons and De Ferranti patents is that Davison has a new arrangement of gearing as the means for rotating the shaft. The
212 Curtis patent does not show the application of turbines to a boat. It shows two turbine wheels rotating two shafts, extending in different directions.

Q. In respect to that difference that you have called attention to, please compare the construction in Exhibit 27, which is the torpedo here in court, with the constructions shown in these four patents, and state what resemblance or differences you find.

A. The defendant's torpedo, Exhibit 27, differs from all four of the patents in that the plane of rotation of the turbine wheels is horizontal, so that their axes are at right angles to the main axis of the torpedo, that being a difference which the defendant's torpedo has as compared with all four of these patents. Otherwise, the defendant's torpedo, Exhibit 27, differs from the three patents of Curtis, Parsons and De Ferranti in that it has gearing interposed between the turbine wheels and the shafts driven by them. The defendant's torpedo differs from the Davison patent both with relation to the direction in which the turbine wheels rotate, and also because it has a substantially different gearing for rotating the propellers. Perhaps that can be stated most strikingly by saying that the defendant's torpedo has eight gears, whereas the Davison organization has fifteen gears for doing the same work. Also in the defendant's torpedo, the organization is such that there are two different shafts for driving the different propellers, and one of those shafts is driven in one direction by one turbine wheel, whereas the other shaft is driven in an opposite direction by the other turbine wheel. This is a difference over the Davison patent, but, except
213 for the gearing, this principle is similar to that of the Parsons and De Ferranti patents, where two opposite turbine wheels rotate the two different propeller shafts in opposite directions. I have thus far referred to the construction shown in figures 3 and 4 of the Davison patent, because that is the construction of the Davison patent which is closest to the construction shown in Exhibit 28. Davison has other constructions in his patent which I will not refer to unless specifically requested.

Q. With respect to each of these four patents, please state what is the direction of the reaction of the fluid acting to impel the first turbine wheel and the direction of the reaction from the first to the second turbine wheel, and the direction of reaction from the second wheel? State whether those directions differ in either of the four structures illustrated.

Mr. Coles: The same objection as before.

A. The four patents are all substantially the same in this particular. The reaction from the fluid inlet nozzle to the first wheel in each of the four patents is opposite to the direction in which the first wheel rotates. In each case the reaction due to the flowing of

the fluid from the first wheel to the second wheel is in the opposite direction. Accordingly these two reactions tend to balance each other in the operation of the wheels.

Q. I show you Exhibit 50, patent to F. M. Leavitt, No. 748,759, and ask you if you are generally familiar with the construction shown in that patent?

A. Yes.

Q. If it be the fact that in a torpedo having as its propelling mechanism the turbine construction shown in this patent, Exhibit 50, that the nozzle reaction would give the torpedo, at the instant of launching a roll in the contrary direction to the rotation of the turbine wheel, I ask you whether that would be overcome by the adoption of the counter revolution turbines of either of the four patents previously referred to?

Mr. Coles: Complainants' counsel objects to the question for the reasons already stated and furthermore because this witness has not been asked whether the facts on which the hypothetical case stated in the question were disclosed in the Leavitt patent or not. It is further objected to as leading.

The Court: Objection overruled.

Mr. Coles: I except.

A. It would.

Q. Now, taking up the question of ball bearings, let me ask you if you have ever had any especial experience, or given particular study to the general problem of ball bearings?

A. I have. I have been familiar with ball bearings for over 25 years. I have seen them in operation—

Mr. Youngs: Objection is raised to the last part of the answer and we ask that it be stricken out. He has already answered the question.

The Court: Yes, he has already answered it.

Q. Have you ever testified as an expert in any suits concerning ball bearings?

Mr. Coles: The same objection.

A. Several.

Q. Have you examined the blue prints submitted by the Bureau of Ordnance, Exhibits 52 and 53, accompanying the letter of March 21, 1906, Exhibit 51?

A. Yes.

215 Q. Do you understand the construction of bearing from that?

A. Yes.

Q. Will you please explain it briefly?

Mr. Coles: The same objection.

A. As shown in Exhibit 53 there is a cage or holder which retains in place three balls and which keeps those balls separated from each other, so that they will not rub frictionally against each

other. When in use this cage with its three balls is used at each end, or rather each side of the rotating wheel of the gyroscope, as shown in Exhibit 52, so that these balls are interposed between the two axes of the rotating gyro wheel and of the surrounding support, thus reducing the friction of the gyro wheel.

Q. In the ball bearing art is there any well-recognized classification? If so, what?

Mr. Coles: The same objection.

A. There are two well-recognized classes of ball bearings. In the first the bearing is a full bearing. That is to say, the balls fill entirely the race way between the rotating part and its supporting journal. In the second class the balls are separated from each other by a cage, holder, retainer, or spacer, as it is called, so that not as many balls are employed as in the first case, and the balls are prevented from rubbing against each other.

Q. In which of these classes does the construction shown in these blue prints 52 and 53, fall?

A. The second class.

Q. Have you examined the ball bearing construction in the gyroscope of Exhibit 27?

A. I have as well as can be seen from any exterior inspection of this particular exhibit.

Q. As it is difficult to see the balls in this exhibit I now show you a drawing which you may assume, hypothetically, to be a correct illustration of these balls. I refer to the upper left hand figures and ask you if you understand the construction shown in this drawing?

A. I do.

Q. Please explain that construction to the Court.

A. As shown in the plan view in the left hand upper corner, the ball bearing is composed of six balls which fill the entire race way between one of the axes of the gyro wheel and the surrounding support. This belongs to the first class referred to in my preceding answer.

Mr. Fraser: I offer this drawing in evidence.

Mr. Coles: It is objected to on the same ground as before stated. The drawing is marked defendant's Exhibit 107.

Q. I show you a patent to Obry, No. 648,878, May 1, 1900, and ask you to explain that construction and compare it with defendant's construction.

Mr. Coles: The same objection.

A. This patent is for improvement in gyroscope for torpedo steering mechanism and it shows ball bearings for the gyro wheel. The specification says, beginning at line 19:

"As shown by the drawing, the conical ends of the axle *r* run on the balls *t*, held in adjustable blocks or plugs *T*, each of the said plugs being screwed radially into the gimbal-ring *q* and having in its face a cup-shaped cavity adapted to receive the balls."

The drawing shows the construction only in section, but there is no indication of any separating mechanism at all to keep the balls apart. I am therefore of the opinion that it shows the ball bearing belonging to the first class to which I have referred.

217 Mr. Fraser: I offer this patent in evidence.

Mr. Coles: The same objection.

The patent is marked defendant's Exhibit 108.

Q. I now show you patent of F. M. Leavitt, No. 814,969, March 13, 1906, and ask you to explain the construction of ball bearings on that.

A. This is for improvements in gyro scope spinning devices and shows in figure 2 ball bearings for the gyro wheel. The specification beginning at line 73, page 1, referring to this gyroscope wheel says:

"It is shown as turning in ball-bearings *c* within a frame *d*, constituting the inner gimbal-ring, and which is pivoted on an axis at right angles to that of the fly-wheel (shown as a horizontal axis) in a frame *e*, constituting the outer gimbal-ring, which in turn is pivoted on an axis normally at right angles to both the preceding axes (shown as a vertical axis) to a fixed frame or outer support *K*, which is shown as an inclosing case or box."

Mr. Fraser: I offer this patent in evidence.

Mr. Coles: The same objection.

The patent is marked Defendant's Exhibit 109.

Q. Now, as to compound regulation of air, so-called, I ask if you are familiar with what are called pressure reducing valves?

Mr. Coles: The same objection.

A. I am.

Q. Do you understand their use in a torpedo?

A. I do.

Q. I show you copies of two patents to John L. Lay, first, No. 211,303, of January 14, 1879; the second is No. 217,120, of July 1, 1879. I ask you to examine these and state whether you find in them disclosures of a double or compound reduction of gaseous pressure and explain the operation of the devices.

Mr. Coles: The same objection.

A. I will first refer to the Lay patent 217,120, July 1, 1879, which is for an improvement in valves for torpedoe boats. The specification says, beginning on the first column, page 1:

"The specific devices for which I desire to secure protection in the present application are the valves and valve-connections, which enable me to use carbonic acid gas, ammoniacal gas, condensed air under high pressure, or similar expansive gases, for the propulsion of a submarine vessel."

Accordingly, Lay has a gas reservoir and he states that in this the gas is stored under great pressure near the top of column 2 of page 1. This gas, or air, in passing to the motor of the torpedo, is to be reduced in pressure, and Lay reduces it by passing successively through

two different regulating devices for the purpose of bringing it finally to the working pressure:

"The gas pipe *a* leads from the reservoir *L* toward the engine. When the stop-cock *a* is opened, as it will be before starting the boat, the gas passes through *a* to *Axx*, where its pressure is reduced. It then passes through *a1* to *Bxx*, where the pressure is still further reduced. The gas then passes still farther toward the engine through pipe *a3*, past a safety valve at *a6*, to the throttle-valve *a7*, and on to the engine *F* in due course."

This organization of the compound reducing valve is also defined in Claim 5 of the patent, which says:

219 "The combination of a gas-reservoir, an automatic reducing valve, as *Axx*, a second automatic valve, controlled by a spring to reduce the gas to a determinate pressure, as *Bxx*, and a throttle-valve, as shown and described."

The other Lay patent 211,303, January 14, 1879, is for the torpedo boat itself, in which the double reducer is employed, and it describes the double reduction in substance, the same way as in the patent to which I have already referred.

Mr. Fraser: These Lay patents are offered in evidence.

Mr. Coles: The same objection.

The patents are marked defendants Exhibits 110 and 111.

Q. You said that these patents related to improvements in torpedo boats. Please examine the patents again and state your understanding of that term.

Mr. Youngs: I object to the gentleman's understanding as a conclusion.

The Court: It amounts to the same thing.

A. In calling it a torpedo boat I am simply using the language of the patent itself. What the patent disclosed is what we now call a torpedo. This very plainly appears from the specification on the first Lay Patent 211,303.

Mr. Youngs: I ask to strike that out. Let him read what is there.

A. It says:

220 "The said invention is designed to provide the means whereby a boat or vessel charged with suitable explosive materials—that is to say, a torpedo boat—may be propelled by machinery contained therein, and at the same time may be kept fully under the control and management of an operator or staff of operators at a station on land or on board a ship or floating battery. After being launched from such station, vessel, or structure, the said torpedo boat may be kept under observation and accurately guided or directed to an iron-clad ship or other object of attack, and may be fired or discharged at any desired moment, or may be caused to return to its station without being fired."

Q. Aside from any details of design of the regulating valves what, if any difference do you find between the double or compound regu-

lation of air pressure in these Lay patents and that which has been disclosed here with reference to the Bliss-Leavitt torpedo?

A. No difference except in details of construction.

Cross-examination of the witness is deferred until Wednesday morning.

221 FRANK C. B. PAGE resumes the stand and examination of the witness is continued.

By Mr. Platt:

Q. I call your attention to Complainant's Exhibit 29, being a letter from Mr. Gleaves to the chief of the Bureau of Ordnance, dated January 2, 1907, and the endorsement that constitutes part of that exhibit. Were you in Court and did you hear the testimony of Mr. McCormick with reference thereto?

A. I did.

Q. Did you hear Mr. McCormick say that between the 9th and 21st of January, 1907, he saw you personally and talked with you about that document?

A. I heard him say that.

Q. Was that correct?

A. No, that is not correct.

Mr. Youngs: That is objected to.

Q. Was it a fact?

A. It is not the fact.

Q. Is it a fact that Mr. McCormick repeatedly asked you to acknowledge that correspondence in reference to the balanced turbine and that he was unable to get a written acknowledgment?

A. No, that is not the fact.

Q. Is it a fact that the acknowledgment in writing of that paper was evaded by you?

A. No.

Mr. Coles: I move to strike out the testimony.

The Court: You may ask if he did.

Q. Did you have an interview between the 9th and the 21st of January on that subject, with Mr. McCormick?

A. I did not.

Q. Where were you between the 9th and the 21st of January, 1907?

A. I sailed for Europe on the 8th of January and was in Europe for a number of weeks.

222 By the Court:

Q. Do you mean to say you were in Europe during all the time between those dates?

A. Yes, well, I was on the water. I sailed on the Kaiser Wilhelm on the 7th.

By Mr. Platt:

Q. Will you look at the paper I hand you and see what that is?

A. This is a check of the E. W. Bliss Company in payment for my passage on the Kaiser Wilhelm, the check is dated January 7, 1907.

Q. Mr. Page, where did you get this paper?

A. It came from the files of the company.

Mr. Platt: I offer the document in evidence.

Mr. Coles: I object to it on the ground that it is not the best evidence, is incompetent in every respect.

The Court: I sustain the objection.

Mr. Platt: I except and ask to have the paper marked for identification, Exhibit 112.

Q. Will you look at the paper I now hand you and state whether it refreshes your recollection as to where you were on the 15th of January, 1907?

Mr. Bick: That is objected to. There is nothing to show that he cannot recall where he was on the 15th of January, without anything to refresh his recollection.

The Court: He has testified where he was not.

Q. Where were you, Mr. Page?

A. In Paris.

Q. How do you know you were in Paris on the 15th of January?

Mr. Bick: That is objected to on the ground that counsel is
223 cross examining his own witness.

The Court: I sustain the objection.

Mr. Platt: I except.

Q. Do you remember sending any letters or telegrams from Paris while you were there between the 9th and the 21st of January, 1907?

Mr. Bick: That is objected to as immaterial.

The Court: Objection sustained.

Mr. Platt: I except.

Q. I show you a cablegram; do you remember sending that?

Mr. Bick: That is objected to as immaterial.

The Court: I will sustain the objection at this time.

Mr. Platt: I except.

Mr. Platt: I offer the document in evidence.

Mr. Bick: It is objected to as immaterial.

The Court: I sustain the objection.

The paper is marked for identification Exhibit 113.

Q. I show you a paper; where were you on the 28th of January, 1907?

Mr. Bick: That is objected to as immaterial.

The Court: I will allow him to state.

Mr. Bick: I except.

A. In London.

Q. How do you fix that date?

Mr. Bick: I object on the ground that he is cross examining his own witness.

224 The Court: There is no occasion for supporting the witness at this time. I sustain the objection.

Mr. Platt: I except.

Q. I ask you whether the paper that I now hand you is a cablegram you sent from London on the 28th of January, 1907?

Mr. Bick: That is objected to as immaterial and leading.

The Court: Objection is sustained.

Mr. Platt: I except.

The paper is marked for identification Exhibit 114.

Q. When did you first see that Exhibit 29?

A. I saw this in Court on the motion for preliminary injunction, when that was first being considered.

Q. When did you come home from Europe after the 21st of January, 1907?

A. I arrived on the Savoie, French line; I can't give the exact date, somewhere between the 1st of February and the 15th, 1907.

Q. When you came home was that paper or document or anything connected with it shown to you?

A. No.

Q. When did you first learn that the Government claimed that the balanced turbine came under the 19th clause of the contract of 1905, or the so-called secrecy clause of the different contracts?

Mr. Bick: That is objected to as leading and immaterial.

The Court: Objection overruled.

Mr. Bick: I except.

A. The first I knew of the Government's claim that the balanced turbine came under the secrecy clause of the 1905 contract
225 was in 1911, by their letter of April 3rd. I think it is an exhibit here.

Q. I call your attention to Complainant's Exhibit No. 14, which is a letter from the Chief of the Bureau of Ordnance, being folio F, page 30; is that the letter to which you refer as containing such information?

A. That is the letter.

Q. Now please look at the letter of April 24, 1911, from the Bureau of Ordnance to the Bliss Company, dated April 24, 1911, Exhibit 12, and state whether you had prior to that time any other information as to the claim of the balanced turbine coming under the provisions of Clause 19?

A. No; that is the first notice that I had that the Government claimed that the balanced turbine came under that clause.

By the Court:

Q. You stated that you had charge of the torpedo work?

A. I had principal charge.

Q. You are active manager of the Bliss Company?

A. Yes, sir.

By Mr. Platt:

Q. Did you, at that time, have the files of the company searched for any copies or record of the letter of January 2, 1907, and the endorsements on it?

Mr. Coles: That is objected to as immaterial, also as an attempt to cross examine his own witness.

The Court: Objection overruled.

Mr. Coles: I except.

A. Yes, I had our files searched.

Q. With what result?

A. The result that we were unable to find we ever had received such notice or had such notice on file.

226 Mr. Bick: I object and ask to have the testimony stricken out unless the witness shows he himself made the search.

By the Court:

Q. You did not make the search?

A. I had the search made; I did not make it.

Mr. Bick: I renew my motion to strike out the testimony.
Motion granted.

By Mr. Platt:

Q. Mr. Page, what did you do personally about having the search made?

A. Why, my first act was to see if Mr. Leavitt had any recollection of having received such a notice in my absence. On his informing me that he had had no such notice——

Mr. Bick: It is objected to as immaterial and not binding on the Government and hearsay.

By the Court:

Q. After the consultation what took place?

A. I instructed my secretary to make a search of the files to see if we could find such a notice.

By Mr. Platt:

Q. Do you know whether such a search was made?

Mr. Bick: That is objected to as incompetent.

By the Court:

Q. Did you see it made or is it from the fact that they reported to you that it had been made that you are testifying?

A. I saw it going on, yes, I actually saw it being made.

Q. By the secretary?

A. Yes.

227 The Court: He cannot testify as to what the secretary did. We must have the secretary here.

By Mr. Platt:

Q. I call your attention to complainant's Exhibit 19, being a letter of October 21, 1905, from the Chief of the Bureau of Ordnance to the Bliss Company, in which it is stated that the Bureau encloses "herewith a corrected printer's proof of the proposed contract and specification which it desired you should carefully consider and inform the Bureau if both can be printed as they stand." Now I ask you whether the proof sheet that I now hand you is the corrected printer's proof, so-called referred to in that letter of October 21st?

Mr. Bick: That is objected to as wholly immaterial to the issues in this case. He should state what it is.

By the Court:

Q. Do you know?

A. Yes, I know that was the enclosure in this letter and we received it.

The Court: All right, go on.

By Mr. Platt:

Q. Attached to that printer's proof appears a typewritten sheet: is that the paper that came with the letter of October 21, 1905, Complainant's Exhibit 19 and which is referred to as the new clause (19)?

A. Yes, that is the paper which came with that printed proof.

Mr. Platt: I offer these two papers in evidence.

Mr. Bick: Objected to on the ground that it is immaterial to the issues here and is already in the contract in question.

The Court: I have admitted it.

228 The papers are marked Exhibits 115 and 116.

Mr. Bick: I except.

Q. Did you negotiate this contract? That is the contract of 1905?

A. Yes.

Q. Did you have at that time the principal charge of the negotiation of the contract?

A. Yes. I did not actually sign the contract, but I negotiated particularly all important details in connection with it.

Q. At the time that this typewritten document, Exhibit 116, reached you did it contain the penciled memoranda which appears on the face and on the back of it?

A. No, it did not have that penciled memoranda on the back of it.

Mr. Bick: Then I ask to have that stricken out as far as the penciled memoranda is concerned.

Mr. Platt: I exclude that from the offer, of course.

Q. In whose handwriting is that penciled memoranda?

A. My handwriting.

Q. Did you negotiate the contract of June 16, 1909, which is marked Complainant's Exhibit 2-A? I show the exhibit?

A. Yes, I negotiated that contract.

Q. And you signed that contract for the Bliss Company, did you not?

A. Yes.

Q. Now, at the time that you negotiated that contract with the officers of the Government, did you know of the existence of the Davison patent 858,266, being complainant's Exhibit No. 3?

A. Yes, I knew of it.

Q. Did you know what it contained?

A. Yes.

Q. In the negotiations for that contract was anything said
229 by the officers of the Navy Department who negotiated it, about any claim that the balanced turbine should come under the provisions of the 19th clause of the contract?

Mr. Bick: That is objected to as entirely incompetent and immaterial to the issues.

The Court: Objection sustained.

Mr. Platt: I except.

Mr. Platt: I offer to prove that the contracts for the manufacture of the Bliss-Leavitt torpedo were entered into between the E. W. Bliss Company and the United States, represented by the Chief of the Bureau of Ordnance of the Navy Department, acting under the direction of the Secretary of the Navy, under the dates of November 22, 1905, for 300 torpedoes; April 20, 1909, for 42 torpedoes; June 16, 1909, for 60 torpedoes; October 22, 1909, for 100 torpedoes; July 27, 1910, 24 torpedoes; December 24, 1910, 32 torpedoes; December 24, 1910, 50 torpedoes; June 12, 1912, 120 torpedoes, these all being intermediate contracts, except the first and the last and the one of June 16, 1909, for 60 torpedoes being already in evidence.

I offer to prove that in each of these contracts, except the one of June 12, 1912, the 19th clause was in exactly the same words, and in the contract of 1912, the 20th clause was in substantially the same words as the 19th clause of the previous contracts.

In other words, I mean to say that the clause, the so-called secrecy clause, was carried into all of the contracts as the 19th clause except the contract of 1912, and there it is carried in as the 20th clause.

230 Mr. Bick: We have no objection to that offer to prove but believe that it should be supplemented by the statement that in the contracts of June 26, 1912, and May 9, 1913 the same provision was known as the 20th clause.

Mr. Platt: I do not offer this. I do not think they belong in. I have no objection to their going in of course.

Q. Did you negotiate all these contracts that I have named subsequent to the contract of November 22, 1905?

A. Yes.

Q. In the negotiations of these contracts was any statement made

by any officer of the Navy Department with whom you conducted such negotiations as to the claim that the balanced turbine came under the 19th clause of the contract, except that I exclude from that question the contract of June, 1912?

Mr. Bick: That is objected to on the ground that the contract is the best evidence. It is immaterial as to what conversations he had, and incompetent.

The Court: I sustain it as incompetent.

Mr. Platt: I offer to prove by this witness that no claim that the balanced turbine was covered by the 19th clause of any of these contracts was made at the time the contracts were made.

The Court: I make the same ruling.

Mr. Platt: I except.

Q. Has any written notice under the 19th clause of any of these contracts down to June, 1912, been received by the Bliss Company from the Navy Department?

231 Mr. Bick: That is objected to as calling for a conclusion of the witness, and the notice speaks for itself. It is incompetent and immaterial and calls for a conclusion of law.

The Court: I think it is admissible.

Q. I read the following proviso from the 19th clause of the contract of June 16, 1909, being Complainant's Exhibit 2-A:

(Proviso read.)

Has the Bliss Company, at any time, received from the Government or any officer of the Government a written communication such as is described in the clause I have just read?

Same objection; same ruling; exception.

Q. If any such notice as that had been received to whom, in the ordinary course of business would it have come?

Mr. Bick: Objected to on the ground there is no proper foundation for the question.

The Court: Objection is sustained.

Mr. Platt: I except.

Q. In the course of business of the Bliss Company to whom do communications from the Government in relation to contracts for making torpedoes come?

Mr. Bick: That is objected to as calling for a conclusion and immaterial.

Mr. Platt: If your Honor please, one of the propositions which we make is that in none of these intermediate contracts was any notice served, and we consider it a fact that no notice was served.

232 The Court: It could not be assumed that any other notice had been given. I cannot see the necessity of anything further. If I find there is, on the final argument, then I will change the ruling. I will give it consideration. It is a point which you consider of great importance and I will think about it.

Adjourned to 10:30 A. M., November 18, 1913.

November 18, 1913.

Met pursuant to adjournment as before.

Mr. Platt: Yesterday we made an agreed statement of facts about these contracts; I should like to add to that if the other side are willing, that this clause which appears in the second paragraph of the contract of June 12, 1912, beginning with the words "They contain information of a confidential character" and ending with the words "except as limited by Clause 20 of this contract" did not appear in any of the previous contracts.

Mr. Bick: We object as immaterial, so far as the issues in this case are concerned; as for the fact itself, we don't contradict the fact.

Mr. Platt: I offer in evidence letter from Mr. B. B. McCormick, the Chief Inspector of the Bureau of Ordnance of the Navy Department, dated December 11, 1906; it is folio F, page 25. He was the inspector at the Bliss Works at that time.

233 Mr. Bick: We object, if the Court please, to the introduction of this letter, in view of the fact that it was objected to and not permitted to go into the record on the case of the Government. It was a letter between an officer of the Government and his superior.

The Court: I will take it.

Mr. Bick: I should then insist that the Court also accept the endorsements that accompany that communication.

(Mr. Bick reads the endorsements to the Court.)

The Court: Yes.

(The letter of December 11, 1906, is marked Defendant's Exhibit 117.)

(The endorsements appearing at folio F, page 26, are marked Complainant's Exhibit 68.)

FRANK C. B. PAGE, resumes the stand for the defendant.

By Mr. Platt:

Q. Do you know Mr. Yamashita of the Imperial Japanese Navy, whose name appears in this letter, Exhibit 117?

A. I do.

Q. Do you remember a visit that he made on or about December 11, 1906, to the works of the Bliss Company?

A. I do.

Q. Did he at that visit examine any machinery connected with the torpedo at the works of the Bliss Company?

Mr. Coles: Objected to on the ground that it is absolutely immaterial to the issues here.

Objection overruled.

Exception.

234 A. He did examine machinery at that time.

Q. Did you see him do it?

A. Yes.

Q. Did he examine a turbine that had been built for a Bliss-Leavitt torpedo?

Same objection, ruling and exception.

A. Yes.

Q. Describe just exactly what he did examine.

Mr. Bick: Objected to as entirely immaterial and that no proper foundation has been laid, and not the best evidence.

Objection overruled.

Exception.

A. Mr. Yamashita made a tour of our Torpedo Department, and examined a great many parts of the torpedo, one of which was a balanced turbine engine, which we had previously built and tested out at Sag Harbor. This balanced turbine was of the design which was subsequently placed in the torpedoes then under contract for the Government.

Mr. Bick: Objected to as not responsive and we ask that the answer be stricken out.

The Court: That is true.

Mr. Platt: That is what I want to bring out.

Q. Mr. Page, will you describe just what this balanced turbine was and how it was constructed, that Mr. Yamashita examined?

Mr. Bick: Objected to as incompetent; this witness has not been qualified as a person familiar with the technical construction of the torpedo. It is incompetent and immaterial anyway.

Mr. Platt: I am not attempting to examine Mr. Page as
235 an expert; I am asking him for the fact, to describe the machine that Mr. Yamashita examined; the turbine.

The Court: Objection overruled.

Exception.

A. This was a balanced turbine made from the design of the unbalanced turbine by the introduction of reversing gear applied to one of the wheels for causing one of the wheels to rotate in the opposite direction from the other one.

Q. How was this turbine located with reference to the main axis of the torpedo?

A. The wheels themselves were on the main longitudinal axis of the torpedo.

Q. Vertical to the main axis of the torpedo?

A. The wheels were vertical. They were carried on a shaft which was the main axis of the torpedo.

Q. And two wheels revolving in opposite directions?

A. Two wheels revolving in opposite directions.

Q. When was this machine that you have just referred to, built?

A. This engine was built in the first part of November preceding, 1906.

Cross-examined by counsel for complainant.

By Mr. Bick:

Q. This turbine that you were exhibiting to this Japanese officer, was that a turbine that was being built to place in a torpedo for the Government?

A. It was an experimental turbine that we had built.

Q. It was not a turbine that was being built to be used under any of the Government contracts?

A. Not at that time; it was being built with the idea of being offered to the Government.

Q. It had never been offered to the Government prior to the notice of January 10th and the blue print which accompanied it, had it?

236 A. It had been demonstrated before the Government's representative at Sag Harbor, and——

Q. Will you answer my question?

A. Prior to January 10th?

Q. Yes. Had it ever been offered to the Government, this turbine which you were exhibiting to the Japanese officer?

A. I think it had been offered to the Inspectors at our works for presentation to the Bureau for acceptance.

Q. Had you ever offered it to the Bureau of Ordnance of the Government?

A. We had never offered it to the Bureau in Washington, no.

Q. You had some conversation with the inspector at the Bliss Works in reference to it; you mean that?

A. Yes, sir, and at Sag Harbor.

Q. But it had never been formally offered to the Government to be placed in the torpedoes which were being built under the contract with the Government?

A. Well, I don't know whether it had been formally offered at that time.

Q. Had it ever been offered?

A. For their inspection, I know that it had.

Q. When?

A. During the time of our tests and prior to this December 11th; about that time.

Q. And the only way you say it was offered was through an Inspector?

A. To the best of my knowledge.

Q. Verbally?

A. Verbally.

Q. No written communication ever sent to the Government in reference to it?

A. Not that I recall.

Q. And your best recollection is that it was not?

A. I don't recall.

Q. Have you made any search in your records for the purpose of ascertaining whether it was ever offered to the Government?

A. No.

Q. At whose suggestion was this inspection of the turbine made?

237 A. It came about in the ordinary course of this Japanese officer's inspection of our shop; he came, of course, with proper credentials from the Navy Department permitting him to go through our shop.

Q. From which Navy Department?

A. The Navy Department in Washington.

Q. What credentials were there that he presented to you?

A. In every case when a naval officer of a foreign government comes we receive a notification advising that he is coming, and also the Inspector receives such a notification, and we are either informed that we can or cannot show the gentleman around.

Q. Will you say that in this case any communication was sent by the Navy Department to you permitting you to exhibit a turbine to a Japanese officer?

A. Their instructions are never specific in regard to those things; that is, they were not at that time, to the best of my knowledge.

Q. Were these credentials, as you refer to them, in writing?

A. Yes.

Q. Have you any such credentials here?

A. No.

Q. Have you got them in your possession or in the possession of this company?

A. I haven't them in my possession now. I don't know whether we have got them or not.

Q. Will you make a search of your files and ascertain as to whether you have such credentials?

A. Yes.

Mr. Bick: I will ask the Court to have the witness produce that in Court.

The Court: Yes.

Q. Will you kindly describe to the Court the Bliss Works, in so far as they relate to that portion where the torpedoes are manufactured under the Government contract, as far as to whether
238 it is in a separate portion of the business or whether it is in with the other works, or where it is?

A. The main part of the torpedo work is conducted on the fourth floor of our building at the foot of Adams Street; this floor is given up exclusively to the torpedo manufacture. We also do some of our torpedo work in our South Brooklyn Works.

Q. Are any of the torpedoes that are manufactured for the Government made in your South Brooklyn Works?

A. Yes.

Q. Is there an Inspector of Ordnance at the South Brooklyn branch?

A. Yes.

Q. Down at the South Brooklyn branch is that portion of the building that is used for the construction of torpedoes set apart from the rest of the business, the manufacturing?

A. I will have to ask you to describe what you mean by "set apart."

Q. Is it not a fact that you have a certain portion of your premises set apart for the manufacture of these torpedoes that are being made for the Government under these contracts?

A. Well, there is not a well-defined line where the Government work leaves off and the other work begins. In some cases Government work is done in the department with commercial work.

Q. I am now referring to torpedo work.

A. I am referring to torpedo work also. In some cases the torpedo work is done in departments that are principally used for our regular machine work.

Q. That would be the smaller parts?

A. Well, some parts.

Q. Let us get down to the turbine. Where the turbine and these other parts involved in this case are made—are they not made in a certain section of your works set apart for that purpose?

A. Set apart for what purpose?

Q. Just for the purpose of manufacturing these parts for the Government?

A. No.

239 Q. Isn't it a fact that you have a certain portion set aside which you will not permit anyone to enter or inspect without special permission from your company and without special permission from the Government?

A. Yes.

Q. Then there is a portion set apart for that purpose, is there not?

A. Yes, there is a portion set apart for that purpose.

Q. And the purpose of setting apart this portion and prohibiting common ingress to that portion is to prevent anyone from obtaining any secrets which may be in the course of manufacture in that part of the building?

A. That is right.

Q. You have testified that you are practically the manager of the concern; is that right?

A. That is right.

Q. In your business, who takes charge of the management and actual operation of the plant?

A. There is not any one man that takes care of the whole business when I am away; it would devolve on a number of individuals.

Q. Who are those individuals that it would devolve on?

A. Well, I suppose you are particularly interested to know in regard to the torpedo part, in which case that is Mr. Leavitt. The principal work would devolve on Mr. Leavitt.

By the Court:

Q. What does your company make?

A. We make a full, complete line of machinery for works, sheet metal, special machinery, a very large line of it.

Q. Do you manufacture torpedoes that are used for any other purpose than warfare?

A. No.

By Mr. Bick:

Q. And the only torpedoes that you do manufacture, were they up to this time manufactured for the United States, under
240 the Government contract? Is that right?

A. With the exception of a few that we have made for our own experiments.

Q. That is the few that you have made for your own experiments, were they torpedoes that were made pursuant to the specifications submitted with the contracts entered into between you and the Government?

A. In some cases; in some cases not.

Q. How many such torpedoes did you make for experimental purposes, under those conditions?

A. Oh, you are referring now to the torpedoes which conform to the specifications, practically?

Q. Yes.

A. Well, we made—oh, we may have made half a dozen.

Q. Did those torpedoes all contain those various parts referred to in the Bill in equity in this case?

A. I don't think there were more than two that contained the balanced turbine.

Q. And the other elements which are in issue here?

A. I don't know what the other elements are, exactly; it hasn't been made entirely clear what they are.

Q. Well, take the ball bearings for the gyro; are they included in those two?

A. Yes.

Q. And the super-heater as constructed under the notification from the Department?

A. No; the super-heater is obsolete, the one they have furnished us, and we have no use for that.

Q. You say Mr. Leavitt, in your absence, would have charge of all work concerning the manufacture of the torpedoes. That is right, is it?

A. Yes.

Q. And the rest of the work of the office would be divided up, would it not, between the Secretary, Mr. Seaman and Mr. Gabriel and Mr. Aronson?

A. No, I didn't say so.

Q. Well, I am asking you.

A. Mr. Seaman is the Secretary of the company and he
241 performs all the duties incident to that part of it; it is generally understood.

Q. Do you mean correspondence?

A. He opens the mail and that kind of thing; receives the mail.

Q. Upon opening the mail, would he refer it to the various persons having charge of the subject matter?

A. Yes, the mail is distributed.

Q. What is his system of indicating to whom the letters should go?

A. He simply makes various piles of this mail in his office, and tells his boy or assistant there that this goes to that one, and this to that one, etcetera.

Q. Would he indicate on the communication itself with a pencil mark or something, the name of the person to whom it should be referred?

A. When it is possible.

Q. You are acquainted, of course, with the handwriting of Mr. Seaman?

A. I am acquainted with his handwriting.

Q. I show you Exhibit 29 and ask you to examine the lead pencil handwriting in the upper left-hand corner, and ask you if you can tell whose handwriting that is?

A. No, I can't tell whose handwriting that is.

Q. You won't say that it is not Mr. Seaman's will you?

A. I don't know whose it is; I don't know whose it is. It is very much of a scrawl, I should say.

By the Court:

Q. You say you know the Secretary's handwriting. Can't you say whether, in your opinion, that is his handwriting?

A. Well, I don't think it looks like his handwriting.

242 By Mr. Bick:

Q. Why don't you think so?

A. Well, it doesn't look to me like his handwriting.

Q. At the same time, you wouldn't be positive on that point; you are not saying that with any degree of positiveness?

A. It certainly doesn't look like his handwriting to me; I don't care to say anything more than that.

Q. That is the best answer you can give on that?

A. Yes; and I am certainly familiar with his handwriting.

Q. Is it the fact that his handwriting varies at times?

A. I suppose that is true of anyone's handwriting.

Q. But I mean that he intentionally varies his handwriting from time to time?

A. No; I am quite sure he doesn't vary his handwriting from time to time.

Q. Does he sign the checks of the company?

A. Yes.

Q. Does he oftentimes change his style of signature on the checks?

A. No. Not to my knowledge. I also sign those checks and I have never observed it.

Q. When was the first time that you had knowledge of the existence of the design of balanced turbine which you say was examined by this Japanese naval officer?

A. Of that particular design?

Q. Yes.

A. The first week in November, 1906.

Q. From whom did you obtain that information?

A. I conveyed the information; I didn't obtain it.

Q. How was it first called to your attention?

A. That design originated with me; that is, the idea of reversing in that particular way originated with me.

243 Q. I call your attention to a letter in folio B, page 96, being a letter from the Bureau of Ordnance of October 22, 1906, to the Bliss Company. Do you recall the receipt of that letter?

A. Yes, I recall the receipt of that letter.

The Court: It is in evidence as Exhibit 32.

Q. You said that a test of this engine was made at Sag Harbor. Is that correct?

A. That is correct.

Q. When was that test made?

A. It was made in November of 1906.

Q. Were there any of the officers of the Navy at those tests?

A. Yes.

Q. Who?

A. Lieutenant Delaney was present.

Q. Who was Lieutenant Delaney?

A. He was the head Inspector at Sag Harbor, representing the Government.

Q. Is Sag Harbor the place where the Bliss-Leavitt torpedoes were tested for the purpose of having the Government accept them?

A. Yes.

Q. Was that test being made with that view in mind?

A. No; that was an experimental test.

Q. Were you present at the various tests which were made in 1906, the Government tests of your torpedoes?

A. I believe I was.

Q. Did you at that time suggest any in which the sheer could be eliminated, when that question came up for discussion between your officers and the naval officers?

A. Are you talking about sheering or the initial roll? I have heard them both talked about.

Q. The initial roll?

A. My recollection is that the matter was discussed at various times in a general way.

Q. Did you ever make a suggestion to the naval officers or to anyone present at those conferences as to the installation of
244 a balanced turbine system?

A. I remember talking with Mr. Delaney about it.

Q. That was not at these official tests, was it?

A. He was at those official tests, yes; he was the resident inspector at Sag Harbor.

Q. Was he the representative of the Government at these tests for the acceptance of the torpedoes, which were made for the Government?

A. Yes, he was the representative of the Government.

Q. Were you present at the tests which were being made up at Newport, of the torpedoes submitted for inspection?

A. There were no torpedoes submitted for inspection at Newport. They were submitted for—I don't know what you——

Q. Were you present at any tests of torpedoes which were being made during the year 1906 at Newport?

A. No.

Q. Isn't it a fact that it was immediately coming back from one of these Sag Harbor tests that you secured a draftsman and then first advised, as you say you did, this balanced turbine system?

A. Why, I can't say as to that; I know at the time that I mentioned that I did devise this engine.

Q. Isn't it a fact that it was after you had come back from Sag Harbor that you then called the attention of Mr. Leavitt to this principle?

A. No, that is not the fact.

Q. Isn't it a fact that Mr. Leavitt was quite surprised to find out that you knew so much about that principle?

A. No, that is not the fact.

Q. Will you kindly tell me as definitely as you can just when it was that you discussed the balanced turbine engine to Lieutenant Delaney?

A. To the best of my recollection it was in the Fall of 1906.

Q. You have no positive recollection as to the date?

A. No, I have not.

245 Q. Can you approximate it?

A. My recollection is that it was a matter of common discussion during that time, during the summer and fall of 1906.

Q. Do you mean to say that during all the time these tests were being made, the question of a balanced turbine was freely discussed among all the officers?

A. I think so.

Q. Do you know so?

A. To the best of my recollection that was a fact, that it was a matter of general talk.

Q. Who did discuss it with you?

A. Well, I know for sure that I had talks of that kind with Lieutenant Delaney.

Q. And he is the only one you can recall as having had a talk with? A. He is the only one that I can recall definitely having any talks with on the subject.

Q. And you can't fix the date any more certain than you have?

A. No, that is as near as I can fix it.

Q. You never had a talk with Lieutenant Davison about the matter at that time?

A. No.

Q. Or with Commander Williams?

A. Not to my knowledge.

Q. They were present at these tests, were they not?

A. No, they were there as members of Boards, if I recall rightly,

while Lieutenant Delaney was there all the time. Every time I went to Sag Harbor I had occasioned to talk to Lieutenant Delaney.

Q. Was Captain Gleaves there?

A. I think he was there once on a Board during that year.

Q. And you never made any statement to the Board about this matter; you never suggested to them how the difficulties could be overcome?

A. I don't know that the difficulties would be overcome.

Q. Were you present at a meeting of the Board at Sag Harbor on October 30, 1906?

A. I believe I was about that time; I couldn't say it was exactly October 30th. I know the Board met about that time, and I was present.

Q. Then it was shortly after that meeting that you came back and thought of this balanced turbine device?

A. The thought had been with me for some time; but the actual endeavor to put it into practical design which could be used in the torpedo was only attempted by me on my return after that time.

Q. When was the first drawing of this design made by you?

A. November 1st, if I remember correctly.

Q. That is the November 1st after this meeting of the Board in Sag Harbor?

A. Yes.

Re-direct examination by Mr. Fraser:

Q. Please look at the paper that I now show you and if you can identify it, please state what it is.

A. That is the first rough sketch made in connection with the design of the balanced turbine referred to as having been shown Lieutenant Yamashita.

It is offered in evidence.

Mr. Bick: Objected to on the ground that no proper proof of the drawing or when it was made or as to whom it was made by, has been made.

(The paper is marked Exhibit 118 for Identification.)

Q. Who made the sketches that appear on this paper?

A. Mr. Dieter.

Q. Is he present in court?

A. Yes.

Mr. Fraser: Mr. Dieter, will you stand up?

(A gentleman in the courtroom rises.)

247 Q. Is that the gentleman?

A. That is the gentleman.

Q. What is his position with the Bliss Company?

A. Mr. Dieter is a torpedo engineer, assisting Mr. Leavitt.

Q. State what was said between you and Mr. Dieter on the occasion of making these sketches?

Mr. Bick: Objected to what was said.

Objection sustained.

Defendant excepts.

Q. What was the next done after making this sketch?

A. Just sufficient in the way of detail drawings were made to enable the manufacture in the shop of a balanced turbine.

Q. That was the first turbine, you mean?

A. The first turbine.

By the Court:

Q. Your testimony is that you directed Mr. Dieter to make this sketch?

A. That is right, yes.

By Mr. Fraser:

Q. I show you a blue print and ask you if you identify that, and what it is?

A. Yes, I can identify this blue print as a design of part of the first balanced turbine we built; that is the balanced turbine referred to as that shown Lieutenant Yamashita; it is the frame of the engine.

Mr. Coles: We object to any examination of that blue print. Counsel for the Government has not seen it and doesn't know anything about what is referred to.

Mr. Fraser: We will mark it Ex. 119 for Identification and prove it by Mr. Dieter.

248 Q. Please look at this blue print again, and state, so far as you know, when the alterations that appear on that, were made?

Objected to.

The Court: Go on and answer the question if you can.

Complainant excepts.

A. November 7, 1906.

By the Court:

Q. What do you mean by alteration? The black ink marks?

A. There is an alternation here upon this drawing. This drawing was originally a standard drawing of an engine frame for an unbalanced turbine engine; and it had those alterations made to permit the introduction of reversing gears which would permit of revolving the turbines in opposite directions.

Mr. Coles: I move to strike out the testimony upon this subject as incompetent.

The Court: I will take it for the present.

Exception.

By Mr. Fraser:

Q. I show you two more papers. Please state whether you identify those, and if so, what they are?

A. This drawing on tracing paper is a drawing showing two turbine wheels, one of which has been designed to permit of its revolving in the opposite direction from the other.

Q. State if you know when that drawing was made.

Same objection, ruling and exception.

A. It was made the first week of November in 1906.

249 Mr. Coles: I move to strike out the answer as not being responsive to the question; as being indefinite.

By the Court:

Q. Can you give the day?

A. No, I cannot give the day, but I know absolutely it was in the first week in November, 1906.

(The paper is marked Exhibit 120 for Identification.)

By Mr. Fraser:

Q. Now, the other paper; what is that?

Same objection, ruling and exception.

A. This is a rough sketch showing some of the bearings of the turbine in question.

(The paper is marked Exhibit 120 for Identification.)

Q. State whether these four drawings that you have just identified were made before or after the construction of that balanced turbine which was at your shop in December, 1906?

Same objection, ruling and exception.

A. They were made before.

Q. Are they drawings that were used in the building of that experimental balanced turbine?

Same objection, ruling and exception.

A. They are.

Q. Now referring to Exhibit 117, the letter concerning the visit of Assistant Engineer Yamashita to the Bliss Company's works. Do you know whether anyone else accompanied by Mr. Yamashita on the occasion of his tour through your works?

A. Mr. Leavitt, I believe, accompanied him.

Q. Anybody else?

A. The Government Inspector always accompanied a naval officer from another Government going through our works.

250 Q. And the Government Inspector at that time was Mr. McCormick, who wrote this letter?

A. Mr. McCormick.

Cross-examined by Counsel for Complainant.

By Mr. Coles:

Q. Referring to Defendant's Exhibits 120 and 121 for Identification neither one of those papers is authenticated in any way, is it?

A. I should like to ask what you mean by "authenticated."

Q. Signed or dated or stamped or otherwise marked so as to indicate who did the work and when it was done.

A. No, except that it has an order number on the drawing; that is the only mark, and the fact that it states that it is for experimental turbine torpedoes. There is no date.

By Mr. Fraser:

Q. What drawings are you referring to?

A. I am referring to Exhibits 120 and 121.

By Mr. Coles:

Q. How do you fix the date when they were made, so as to be able to make any personal statement on the subject?

A. Well, I am very sure that these drawings were made in conjunction with the drawing on the other sheet which has been identified.

Q. I didn't ask you that. I asked you how you fixed the date?

A. Well, that is how I fix the date. That, and my knowledge of this particular drawing as to what it shows.

Q. You are not able to do it in any other way?

A. That is the only way.

Q. You stated that you were at the meeting of the Torpedo Board at Sag Harbor on October 30, 1906.

A. I believe I was there.

Q. Isn't it a fact that from one of the naval officers present 251 at that Board meeting you obtained verbally the idea that the Bureau of Ordnance had been working at Newport on the development of a balanced turbine?

A. I don't know that that is the fact, or is not the fact.

Q. You will not deny it now?

A. No, nor affirm it.

Q. You will not deny that on October 30th, 1906, at the meeting of that Board you received information through a conversation with Admiral Mason, then Chief of the Bureau of Ordnance, that the Bureau was developing a design of balanced turbine, and that that was the design which had been referred to in the Bureau letter to the Bliss Company of October 22, 1906, Exhibit 33?

A. Oh, I have no recollection of any such talk with Admiral Mason.

Q. Do you remember where you were when this alleged conception was made by you of the balanced turbine?

A. By conception do you refer to the design of the turbine?

Q. I refer to what you have said of your connection with it.

A. Yes, I remember.

Q. State where, and how you remember.

A. I went to Mr. Dieter in our designing room after having first given careful consideration to the manner in which these turbines could be rotated in opposite directions, and requested him to make detailed drawings which would enable us to manufacture the turbine in our drafting room. I went to Mr. Dieter in our drafting room.

Q. You haven't quite answered my question. I want you to state

where you were when you first gave what you call careful consideration to this idea?

A. I was in our Torpedo Department on the fourth floor.

Q. After October 31, 1906?

A. About that time.

252 WILLIAM DIETER, being duly sworn and examined as a witness for the defendant, testifies:

By Mr. Fraser:

Q. You are employed by the Bliss Company?

A. Yes, sir, I am.

Q. And have been for how long?

A. About eight years.

Q. In what capacity are you employed there?

A. Chief draftsman.

Q. What connection, if any, have you had with drafting work concerning torpedoes?

A. Well, about seven and a half years.

Q. For seven and a half years you have been concerned in drafting work with torpedoes?

A. Yes.

Q. I show you a drawing marked Exhibit 118 for Identification, and ask you when you first saw that and what you know about it?

A. That is my drawing.

By the Court:

Q. Did you make it?

A. Yes.

Q. When?

A. The date is November, 1906; that is my signature and my handwriting.

By Mr. Fraser:

Q. Tell what occurred in connection with that matter on that date?

Objected to as incompetent.

By the Court:

Q. Did you make that by direction of Mr. Page?

A. I did.

Q. Did he give you the material from which the design was drawn?

A. No, he simply gave me the idea of rotating the turbines in opposite directions, and I filled in the gear scheme.

253 By Mr. Fraser:

Q. Then you made the sketches on that sheet after that talk?

A. Yes, sir, I did.

Q. Then you showed them to Mr. Page, did you?

A. I did.

Q. Did he approve or disapprove them?

A. He approved them, and we went right ahead and built it.

Q. He instructed you to go ahead and build the turbine according to that sketch?

A. Yes, sir.

Q. And then you made some other drawings, did you?

Objected to as leading.

A. I made some other drawings.

Q. Referring to this first sketch, was Mr. Page present during the making of this sketch, or any part of it?

A. Well, I don't remember whether he was present while we were making the sketch, but he certainly was present after we made the sketch, because I took it right down to him at the time.

Q. I refer you to the sketches on the lower part of the sheet and ask you to explain those?

A. When I made that sketch Mr. Page was present; it is just the discussion of the relative direction of speed of the different rotors.

Q. Just explain that to the Court, please.

A. That shows the direction of the turbine wheels that are referred to. It shows the different relative speeds of the rotors and the directions; the upper plan shows the ordinary or unbalanced turbine, while the lower one is the original sketch of the balanced turbine showing the direction of the wheels and the speed equivalents.

Q. The arrows on that sketch show that the two wheels revolve in contrary directions, do they?

A. Yes, sir.

254 Mr. Fraser: I offer the sketch in evidence.

Objected to as not properly identified and as incompetent, irrelevant and immaterial.

Objection overruled.

Exception.

(Exhibit 118 for Identification is received in evidence as Exhibit 118.)

Q. I show you blue print 119 for Identification and ask you if you identify that, and what you know about it?

A. That is a marked-up copy of the blue print. We very frequently use that method to reduce the time necessary to make new drawings. This is one of the standard blue prints of the unbalanced turbine frame.

Q. You mean that that was before the alterations were made?

A. Yes, and it is marked up to adapt it to the unbalanced type.

Q. Who marked it up in that way?

A. I don't remember. I didn't do it personally, but it was done under my direction at the time.

Q. After it was marked up in that way, what did you then do with it?

A. It was sent to the shop and a pattern was made.

Q. Was it submitted to Mr. Page for his approval?

A. I believe it was.

Mr. Coles: I move to strike out all this testimony.

The Court: We don't want what you believe; we want your knowledge.

Q. Is any date on that which shows when those alterations were made?

Objected to; he should testify from his own knowledge.

A. It is marked "November 7."

Q. Whose handwriting is that?

255 A. I don't know whose it is; some assistant of mine, I believe.

Q. Do you know when it was written?

A. It was written on the same date, November 7.

Mr. Coles: We renew the objection to all this testimony.

(The paper is offered in evidence.)

Same objection.

The Court: You may cross examine him on it now if you wish to.

Cross-examined by Counsel for Complainant.

By Mr. Coles:

Q. You cannot swear who made the black ink lines that are drawn over the original blue print which has been marked 119 for identification, can you?

A. I cannot swear who did it, no.

Q. Without looking at this drawing to refresh your memory, you couldn't testify from personal knowledge or recollection when this blue print was originally made or when the black ink marks were put on it, could you?

A. Yes, I could from the date of my first sketch; I know that this thing was made inside of a week after my first sketch.

Q. I didn't ask you that. I asked you if you could, from personal knowledge, without having refreshed your memory by looking at this paper, tell exactly when this drawing was first made or when the black ink marks were subsequently made on it?

A. I don't think I could give you the exact date, no.

Q. You can't tell me now, sitting there, and I holding this drawing here, when the original blue print was made or when the black ink marks were made, can you?

A. Well, the black ink marks were made November 7, 1906.

256 Q. You don't know that from your personal knowledge, except by referring to some paper, do you?

A. I know that that is a fact.

Q. How do you know that if you don't know who put them on there?

A. I don't remember the man, but I know that that was made on that week.

Q. You only know that by having referred to the drawing as recently as this morning, don't you?

A. Well, those records are all right.

Q. Never mind that. You are on the stand and swearing from personal knowledge. I am asking you if you could tell from personal recollection, without looking at these papers, what dates the papers were made or who made them?

A. No, I know simply one of the drawings I did make; I know that.

Q. Then you can't say who made that one that you say you didn't make, or when he made it?

A. Which one?

Q. You say there was one which you did not make?

A. There was one I did make.

Q. But the others you did not make, you couldn't swear positively that you made that one or the other one, without referring to the papers themselves?

A. I can swear they were made inside of a week from that date.

Q. Isn't that an inference that you draw from looking at the papers? You can't swear as to positive dates from memory, can you?

A. Not from memory, no.

Mr. Coles: I renew my objection to the introduction of this exhibit.

Objection overruled.

Exception.

(Exhibit 119 for Identification is received in evidence as Exhibit 119.)

By Mr. Fraser:

257 Q. Where was the blue print taken from, that you brought to court?

A. We keep a file of all—that is including the complete case of the balanced turbine and all the drawings that we used to make that balanced turbine—all those drawings were kept in that file, in our file wrapper.

Q. In other words, this drawing comes from the records of the Bliss Company?

A. From the records of the Bliss Company of balanced turbines.

Q. I now show you Exhibit 120 for Identification and ask you to tell what you know about that.

A. That shows the rotors of the turbines.

Q. Who made that drawing?

A. I don't remember who made that drawing.

Q. What do you remember about the making of the drawing at the time it was made?

Objected to as leading.

The Court: Go on.

Exception.

A. Well, it was made under my direction at the time.

Q. At that time how many draftsmen did you have under your direction?

A. I believe there were about ten or eleven.

Q. And you can't remember now which of the ten or eleven men made this particular drawing?

A. No.

Q. About how many drawings have you got altogether concerning the torpedoes at the Bliss Company's works?

A. A matter of about four or five thousand.

Q. What was done with that particular drawing after it was made?

A. We made prints of that and sent the prints to the shop. This is a drawing you can make blue prints of.

Mr. Fraser: We offer in evidence the tracing.

Objected to.

258 By the Court:

Q. When was it made?

A. There is no date on the drawing, but it was made inside of a week following the date of the original drawing; that is the original sketch we introduced here.

Mr. Coles: We object to its introduction in evidence; the sketch is without date or any means of fixing its date, and it is incompetent, irrelevant and immaterial.

The Court: I will admit it.

Complainant excepts.

(Exhibit 120 for Identification is received in evidence as Exhibit 120.)

By Mr. Fraser:

Q. This sketch has on it the words "experim. turbine for 21-inch torpedo Order 9669." What does that mean?

A. Well, I suppose it means experimental turbine 21-inch torpedo, Order 9669.

Q. Do those words help you in any way to identify this drawing?

A. I don't see that it helps me in any way.

By the Court:

Q. Do you need any help?

A. No, I know that that drawing was made inside of one week after the date of the original sketch.

By Mr. Fraser:

Q. You said these drawings were sent down to the shop. What was done with them then?

A. After they were sent down to the shop they were rushed through and the actual turbine produced.

Q. Were you aware at the time of the building of that actual turbine in the shop?

A. Yes, sir.

Q. You saw it from day to day?

A. I saw it from day to day.

Q. About how long did it take to build it?

A. Well, I haven't a very clear recollection on that, but I imagine it was about two weeks.

Mr. Coles: I move to strike that out as based upon imagination.

The Court: Yes.

By the Court:

Can you state positively now that it was within two weeks?

Yes, sir, it was within two weeks.

By Mr. Fraser:

Do you know what was done with that turbine after it was in the shop?

We made tests, dynamometer tests, to see how the efficiency compared with the other type of turbine.

Were you present at that dynamometer test?

Yes.

What was the result of the test?

We found that it was a slight improvement over the old type unbalanced turbine.

What was next done with that turbine?

After that it was placed in the torpedo—after the torpedo was completed and made ready for the Sag Harbor tests.

Do you know whether it was sent to Sag Harbor?

I know that it was sent to Sag Harbor.

You didn't go there with it?

I did not.

You were not at Sag Harbor during the tests?

No, sir.

Did you know of its coming back from Sag Harbor?

Yes, sir, I was there when it came back.

Was anything done with it then?

It was taken apart and looked over.

You were present?

Yes, sir.

Cross-examined by Counsel for Complainant:

By Mr. Coles:

How long have you been employed in the drafting work of the Bliss Company relating to torpedo mechanism, or construction?

About seven and a half years.

Can you fix the date any more definitely than that?

Well, I came with the Bliss Company October 1st, 1905; I think it was about the first of January, 1906; that is a little over seven and a half years.

When you first entered in the employ of the Bliss Company, what work were you directly engaged on?

Automobile work.

How long did you work on that?

About six weeks.

Q. Then what kind of drafting work did you do?

A. General machine work.

Q. Do you know how long you were on that?

A. Why, about the same time.

Q. About six weeks?

A. Yes, sir.

Q. It might have been longer, mightn't it?

A. It might have been a little longer; it filled in the three months of October, November and December, 1905, and then I went on the torpedo work.

Q. After that, what kind of work did you go on?

A. I went right back to the torpedo work; I made the drawings for the Sag Harbor equipment.

Q. You say you think you went on to the torpedo drafting work about January, 1906?

A. Yes, sir.

Q. What particular kind of torpedo drafting were you doing when you first started?

A. I think we made some of the drawings for the Mark 1 torpedo.

Q. What parts of the mechanism were you engaged in preparing drawings for?

A. I don't remember.

261 Q. You don't remember how long you were engaged in that part of the work which you can't recall now just what the nature of it was?

A. I don't remember just what parts there were; I know I was in the torpedo work at that time.

Q. All these alleged study sketches and prints which you have been examined about were made by some of the draftsmen in the division where you were, and you say some of them were made under your direction; is that correct?

A. That is correct.

Q. How do you know they were made under your direction, now, at this time?

A. Well, I happen to know that I did have charge of that design of that engine.

Q. That is the only way you recall it now?

A. Yes, sir.

Q. You haven't any independent recollection of having had anything to do with the preparation of these so-called study sketches and blue prints?

A. I do have a recollection.

Mr. Fraser: Which ones are you referring to?

Mr. Coles: I am referring to the three of them that are in evidence, 118, 119 and 120.

Q. When was that recollection first established in your mind? Within the last day or two, by referring to these old sketches?

A. No, that is a very distinct case; I remember that very clearly without reference to the present case.

Q. You remember what very clearly? That you told one of the workmen to prepare these sketches?

A. Yes.

Q. You don't remember which one of these three you told him to prepare, do you?

A. Well, this is my personal sketch (Referring to No. 118); and the other two were prepared under my direction.

Q. And you say they were prepared under your direction because you recall generally that you were in charge of the work at that time?

A. Yes, sir.

Q. You said something on the direct examination about the construction work which was to embody the so-called plan of these sketches and drawings, that it was rushed. Do you know why it was rushed, or by whose orders it was rushed?

A. No, I don't know why it was rushed; but we generally rush things through; that is very common.

Q. Why did you use the word "rush" in connection with this? Is there any more rush about this than about anything else?

A. There may have been a reason; I don't remember the reason.

Q. Don't one of those sketches show on it the word "rush"?

A. Oh, yes, that is very common in our practice, to rush things. I will find that on a great many drawings.

Q. That is the only reason you said it was rushed?

A. Yes, sir.

Q. You would not have remembered that it had been rushed, unless you had seen that word on the sketch?

A. Yes, I would.

Q. What makes you remember that it was rushed?

A. Well, it was rushed, I remember that. I know that.

Q. What makes you remember that, independent of seeing it on the sketch?

A. Independent of that I remember that it was rushed.

Q. How do you fix it?

A. I simply remember it; that is all I can say. I just remember that is all.

Q. Did you have anything to do with the construction work, so far as the speed with which the construction work was done, after the drawings had been made in your division? Wasn't that all you had to do with them?

A. Well, I followed it through the shop and kept my eye on it.

Q. Was it any part of your duty after the drawings had been prepared, to have anything to do with the speed with which the construction work was done?

A. No.

Q. Then any order to rush a particular piece of work you wouldn't have had anything to do with, would you?

A. No.

Q. Do you recall now getting any unusual instructions to follow a particular piece of work through the shop?

A. No, I don't remember that.

Q. Why did you follow it through the shop then?

A. Well, that is the practice, to follow the work through.

Q. You have just stated that you usually would not have had any connection with the construction work after the drawing was turned out by your division, and yet you have testified on direct examination that you followed this job all the way through, even to the dynamometer tests. Why did you do that?

A. Well, I did. I don't know why, but we did it.

Q. Did you do it without instructions or with instructions?

A. Well, I believe I was instructed to do that.

Q. You think you were instructed?

A. Yes.

Q. If you hadn't been instructed to do that, you would have been stopped and directed to go back to your drafting room and perform the work that belonged to you up there, wouldn't you?

A. I don't know; I don't quite understand your question.

Q. If you hadn't had some instructions, you wouldn't have left your work in the drafting room to have gone down to the
264 construction department or gone down to witness any tests, would you?

A. Yes, I may have gone because I had other work at the same time; we were carrying on other experiments besides that.

Q. Did Mr. Page ever bring you any other alleged torpedo studies except this one?

A. I don't quite understand; he didn't bring me any studies that I remember.

Q. What started you to work on this then?

A. Why, just a conversation I had with him on the subject.

Q. You don't remember when that conversation was?

A. That was on the same date, November 1st, 1906.

Q. And he didn't have any study or sketch at the time of that conversation, did he?

A. No.

Q. Who usually gave you instructions in reference to getting up drawings of the torpedo mechanism?

A. Mr. Leavitt.

Q. It was rather unusual and exceptional for Mr. Page to take up this matter with you, wasn't it?

A. No, I don't think so.

Q. Was it Mr. Leavitt's regular work, and didn't he ordinarily have any conferences that were had with the drafting room about constructing torpedo mechanism?

A. Well, I didn't study that condition.

Q. You remember that as a fact, that Mr. Leavitt had general charge of the torpedo work so far as construction matters were concerned?

A. Well, I can't make a definite answer to that.

Q. Don't you know that as a fact now?

A. No, I don't.

Q. Wasn't it true then?

A. I believe so.

Q. You think so?

A. Yes, sir.

Q. Was Mr. Leavitt with Mr. Page when Mr. Page first
265 took up this matter with you?

A. He was not.

Redirect examination by Mr. Fraser:

Q. How often did Mr. Page talk with you about changes or improvements in the torpedo?

— I don't remember how often before 1906, but after 1906 quite frequently.

Q. You said that this blue print, Exhibit 119, came out of the file at the Bliss Company's works where you customarily kept the drawings concerning this balanced turbine. Where did these other two drawings, Exhibits 118 and 120 come from before they were brought to Court here?

A. They came from the same files.

Q. All these drawings were continually in that file all this time?

A. Yes, sir.

Q. In whose custody was that file kept?

A. In my custody.

266 FREDERICK VANDUSTER LONGACRE, being duly sworn and examined as a witness for the defendant, testifies:

Direct examination by Mr. Fraser:

Q. Where do you reside?

A. In Yonkers, New York.

Q. Where are you employed now?

A. I am with the Ingersoll-Rand Company, and also at Columbia University.

Q. What is your profession?

A. Engineer.

Q. Were you at any time employed with the Bliss Company, and if so, when?

A. I went in the employ of the E. W. Bliss Company in September, 1897, and left there in September, 1900.

Q. During that time, what was the nature of your employment?

A. I did some general drafting. I was just out of college when I went there, and I did some general drafting at the shop, and later on, after a few months of that work, I went in with Mr. Leavitt in the engineering department, the central room, and worked on experimental torpedo work.

Q. Did you make drawings of the experimental torpedoes under Mr. Leavitt's direction there?

A. Yes, sir.

Q. I show you a drawing and ask you if you can identify it and if so, I will ask you to tell what it is and what you know about it, who made it?

A. I made this drawing. It shows an arrangement of a 2-wheel turbine with gear reduction to drive the shafts of the torpedo.

Q. When did you make that drawing?

A. During the time that I was employed by the E. W. Bliss Company. I couldn't swear to the exact date.

Q. Do you find any identifying number on that drawing?

267 The Court: I thought a draftsman always put his name and date on his drawing.

The Witness: That is not a finished shop drawing; that is a layout from which we make finished drawings.

Q. (Repeated.) Do you find any identifying mark on that drawing?

A. No.

Q. Will you please show the drawing to the Court and explain the construction shown in the drawing?

Mr. Bick: We object, that the drawing is not in evidence and not properly identified.

Mr. Fraser: I offer in evidence the drawing.

Objected to as incompetent, irrelevant, immaterial, and as not properly identified.

By the Court:

Q. How long have you worked with the Bliss Company?

A. Three years.

The Court: This drawing he made some time during the three years, and without any identifying marks of that kind on it. I will receive it.

Complainant excepts.

(It is marked Exhibit 122.)

By Mr. Fraser:

Q. I now show you another drawing and ask you if you identify that, and if so, who made it and when it was made?

A. I made this drawing on or before December 29, 1897. That was the day it was finished.

Q. How do you find that date?

A. On the base of the drawing here.

268 By the Court:

Q. Is that your notation?

A. That is my notation; that is my own handwriting.

By Mr. Fraser:

Q. Your custom was to put the date on a drawing at what time?

A. When we took it off the drawing board, after it was finished, just as we took it off; that was the last thing that went on.

Q. Please explain what that drawing shows.

Mr. Coles: Objected to, that the drawing is not in evidence and not even marked for identification.

The Court: Go on.

By the Court:

Q. In a general way, what is it?

A. This drawing is a drawing of a casing—the part that goes to make the casing of the 2-wheel turbine shown on the other drawing.

Mr. Fraser: Now I offer in evidence this drawing.

Mr. Youngs: Objected to as immaterial and irrelevant.

The Court: It may be received.

Complainant excepts.

(It is marked Exhibit 123.)

Q. Please look at this drawing, Exhibit 123, again, and see if it bears an identifying number?

A. In what way?

The Court: If there is any identifying number, you made it and you ought to know. You ought not to require a bill of particulars.

A. There is an order No. 6035 and date December 29, 1897, on this drawing.

269 Q. What does that order number signify?

A. An order number entered, on which all work, time and construction in this particular work is to be charged.

Q. I show you another drawing and ask you if you can identify this, and if so what it is, and who made it and to what it refers?

A. This drawing shows 2 A-frame castings for supporting that casing, and the engine that goes in it, in the torpedo.

Q. Who made it and when was it made?

A. I made it on or before January 20, 1898, under the same order number.

Q. Then these three drawings all refer to the same device, do they?

A. Yes.

The paper is offered in evidence.

Same objection, ruling and exception.

It is marked Defendant's Exhibit 124.

By Mr. Fraser:

Q. I refer you again to Exhibit 122, and ask you whether that drawing was made before or after the other two drawings?

Same objection.

Q. The other two were 122 and 124?

By the Court:

Q. Do you know?

A. Yes, sir, this drawing was made before those two drawings, and those two drawings were made from this drawing.

By Mr. Fraser:

Q. What, as near as you can testify, your memory being thus freshened, was the date when you made this first drawing?

Same objection.

270 A. About December 1, 1897, between then and the date of the first drawing, within a month. This is December 2, 1897 (indicating); I may have started in November but I finished it in December.

Q. After these three drawings were made what was done toward the construction of the thing shown in those drawings?

A. Those drawings went into the shop to be built.

Q. Did you have personal knowledge of the work on this machine in the shop?

A. Yes.

Q. You visited the shop how frequently during that time?

A. A number of times each day.

Q. You kept watch of the construction of this machine, did you right along, from that time until it was finished?

A. Yes, sir.

Q. Was it finished and tested during your time with the Bliss Company?

A. Yes.

Q. What was done in the way of testing it, what kind of tests were made?

A. The dynamometer test was made in the laboratory before it was put into the torpedo; a special test set made for that; it was put then into the torpedo and the dynamometer test made when it was in the torpedo, before it went for its trial up at Sag Harbor.

Q. What kind of a torpedo was it put into?

A. One of these cigar shaped affairs, automobile torpedo.

Q. A Whitehead torpedo?

A. A special experimental torpedo.

Q. I show you a fourth drawing and ask you if this bears the same number, and if you can identify that?

A. Yes, sir, I made that drawing.

Q. When was that drawing made?

A. It was finished December 11, 1898.

271 Q. How do you account for the date of that drawing being so much subsequent to the dates of the three previous drawings?

A. This is a drawing of the nozzle, and there were a number of shapes of nozzles tried; this is one of them.

Q. You think this is one of the later nozzle types?

A. Evidently it is.

Q. Explain what you mean by a nozzle?

A. A nozzle is an enclosed section, enclosed by metal as a rule, varying in area from the throat to—enlarging from the throat to allow any thermal fluid to expand in passing through it.

Q. What is its relation to the turbine wheel?

A. It is right next to it.

Q. How does the fluid reach the wheel?

A. Through the nozzle.

Mr. Fraser: I offer the nozzle drawing in evidence as Exhibit 1. Objected to for the reasons already stated, as immaterial, irrelevant and incompetent.

The paper is marked Exhibit 125.

Q. I show you two colored drawings and ask you what you know about those and what they represent?

A. I don't know anything about those except that I see it.

Q. When did you first see these two drawings?

A. The other day down at the works of the E. W. Bliss Company.

Q. After that torpedo was built and tested, as you have testified, what was next done with it so far as you know?

A. After what test?

Q. After the test you have described, what next was done with the torpedo.

Objected to because it is not shown it was the same kind of a torpedo or anything of that sort.

272 The Court: Go on.

Exception.

A. It was sent to Sag Harbor for the regular water test.

Q. Did you go to Sag Harbor and see it there?

A. No, sir.

Q. Did you see it after it came back?

A. What was left of it.

Q. Describe its condition then?

A. It had evidently run away, the turbine had all gone to pieces, and there wasn't very much left of it; the steel, for instance, from the outside rim or buckets had flown off into the miter gearing and was solidly welded, the bronze and steel together by the force of contact; it was pretty much of a wreck.

Q. Was there enough left of it for you to identify it as being the remnants of the same machine which had been built at the Bliss Company?

A. Oh, yes, sir.

Q. Describe the way that machine operated when it was in operative condition?

Objected to as immaterial and incompetent.

The Court: Go on.

Exception.

Q. Before describing it just tell how much experience you have had as a mechanical engineer?

The Court: Since that time.

Q. Before and since?

Mr. Young: I object to anything that happened since.

The Court: We will see what the answer is.

273 A. I graduated from Cornell University in 1897 in a course in mechanical engineering; the first job I got was with the Bliss Company.

By the Court:

Q. As what?

A. In the draughting room at mechanical draughting and some engine designing, some designing work; there are different grades

of draughtsmen; it was not mere tracing; more or less engineering knowledge had to be shown in some of it; I worked three years that work with the Bliss Company and then I went with the J. B. J. M. Cornell Iron Works.

By Mr. Fraser:

Q. Will you describe the operation of the driving mechanism of that torpedo, the construction of which you have described?

Objected to as it has not been shown he knows anything about it at all.

The Court: Go on.

Exception.

A. The air was taken from the flask of the torpedo where it stored on pressure up to 2,500 pounds or so, passed through a reducing valve mechanism to the nozzle and the necessary pipe connections; then allowed to expand from the throat pressure in the nozzle to whatever terminal nozzle pressure is desired in accordance with the design of the nozzle, and the first wheel of the turbine which it hits absorbs part of its velocity; it is thrown around the buckets of the turbine until it strikes the second wheel of the turbine where a good deal of the rest of the velocity of the air is absorbed and delivers the power to the shafts on which those turbine wheels run, and through gear reduction to the two driving shafts of the torpedo.

274 Q. Did the two turbine wheels revolve in the same direction or contrary directions?

A. Contrary directions.

Q. At equal or unequal speeds?

A. Equal speeds.

Q. You testify as to that from memory or from drawings or what?

A. From knowledge; I saw it run.

Q. And the two shafts leading back to the propellers turn in contrary directions?

A. Yes.

Q. Was there any gearing at the tail of the torpedo?

A. What kind?

Mr. Coles: Objected to; we are on the turbine, not on the subject of gears at all.

The Court: He may answer that question; I don't want to spend much time on it.

Exception.

A. There were no main power transmission gears at the tail of the torpedo.

Q. And reversal of motion for driving the two propeller shafts in contrary directions was accomplished where?

A. Within the casing holding the turbine and other reduction gearing, as close as we could design it, together.

Q. The gearing close to the turbine wheel?

A. Yes.

Mr. Coles: I move to strike out the testimony of this witness and also the exhibits offered in connection therewith, on the ground that they are immaterial, irrelevant and incompetent to the legal issues in this case.

The Court: Motion denied.
Exception.

275 Cross-examination by Mr. Coles:

Q. You say that the first work you did after leaving Cornell was your employment with the Bliss Company?

A. That was my first job.

Q. What was the first kind of work which you were engaged in when you went into the employ of the Bliss Company?

A. I believe I copied some tracings the first day.

Q. How long were you engaged at that character of work?

A. Only a very short time; I don't know exactly how long.

Q. Three or four months?

A. Oh, no, sir, possibly three or four weeks; I don't know exactly.

Q. You went to work for the Bliss Company in September, 1897?

A. Yes.

Q. You left the Bliss Company in September, 1900?

A. Yes, I think it was September; it was very close to September, either the latter part of September or first of October.

Q. You have not had any direct connection with the work of the Bliss Company since 1900?

A. No, sir.

Q. Without having refreshed your memory by conferences with defendants' counsel and the officers of the defendant company within the last week or so, do you think that you could from independent recollection pick out any particular drawing out of a number of drawings that you were connected with during your service with the Bliss Company, and be able to swear you could identify that particular drawing?

A. Yes.

Q. Do all of these drawings bear any marks which would enable you to identify them?

A. Oh, yes, I made all those drawings; every man knows his own drawings.

Q. I want to know if you remember making those drawings so as to be able to swear you did it, independently of any refreshing influence that comes from looking at the drawing itself?

A. Yes, independent of those drawings or having ever seen them I know that I made those drawings; I know that I did the work.

Q. That has been recalled to your attention recently, hasn't it?

A. Yes.

Q. Without that refreshing influence you could not have gone back into that lapse of time and picked out any isolated act and been able to recall that act, could you?

A. Yes, sir.

Q. By what process do you claim you are able to do this feat?

A. Well, when I have done a piece of work personally I remember it, it does not make much difference what it is; I know I made the drawings of a certain class of design, that those drawings portray it.

Q. When you were describing the alleged operation of the mechanism claimed to be indicated in those drawings all the way through your description you used the word "is"; such, for instance, as, air is drawn in through the nozzle and is applied to the turbine, and all the way through; why did you say is instead of was in that connection?

A. It is a mere—I am not an English scholar.

Q. Wasn't it due to the fact that you are attempting to read those drawings now from what they show, rather than remembering what the instrument did?

A. No, I would describe it the way I feel—I described that as though the operation was taking place before me right now the same as it did then.

Q. Have you any recollection of what your particular feeling was at the time that the instrument was operating or alleged to be operating?

A. I don't understand what you want to know.

277 Q. I am asking you to interpret your own language: you said you did it from your state of feelings; I asked if you recall if you had any particular feelings when you were watching the operation of this instrument which is said to be disclosed in this drawing?

A. Read my answer.

The Court: Ask the question again if you want it.

Q. When you were describing the alleged operation of the instrument claimed to be disclosed in those drawings you had in mind its theoretical operation as you were interpreting the drawing before you, didn't you?

A. Its actual operation.

Q. I thought you said you did not see it operate except in one dynamometer test?

A. It operates during the test.

Q. You don't know how it operated in actual service condition, do you?

The Court: No, he didn't see it; he was not with it.

Q. When it came back from its actual run and you saw its condition it was evident to you that it had not operated successfully, wasn't it?

A. It had met with an accident.

Q. Something had happened to it?

A. Yes.

Mr. Coles: I renew the motion to strike out the testimony of this

witness Longacre, and the exhibits offered in connection therewith, on the ground it is not connected in any way with any torpedo involved in this case, and immaterial and incompetent.

The Court: Motion denied.

Exception.

278 CHARLES G. CURTIS, being duly sworn and examined as a witness for the defendant, testifies as follows:

Direct examination by Mr. Fraser:

Q. Where do you reside?

A. New York City.

Q. What is your occupation?

A. Engineer.

Q. Are you the Charles G. Curtis to whom was granted Patent 566,968 which is here in evidence as Exhibit 104?

A. Yes.

Q. You are the inventor of the so-called Curtis turbine?

A. Yes, sir.

Q. To what extent has that turbine gone into use?

A. It has been manufactured on a very extensive scale by fifteen or twenty companies in different parts of the world; the total output in horse power is somewhere between 10 to 14 millions.

Mr. Young: I object to the question and ask to have the answer stricken out; it is absolutely immaterial to the issues in this case.

Mr. Fraser: I am going to qualify Mr. Curtis as an expert.

The Court: I see no objection to it as a qualification of an expert; that is all it is offered for.

Q. Do you know Frank M. Leavitt, of the Bliss Company?

A. Yes.

Q. How long have you known him?

A. Since 1896 or 1897.

Q. Did Mr. Leavitt ever discuss with you the use of your Curtis turbine in a torpedo?

Objected to.

The Court: I should be disposed to sustain your objection to that. What do you want to do?

279 Mr. Fraser: I want to prove a fact that lies at the invention of the turbine propelled torpedo which in its first embodiment had a balanced turbine, which is in this case; these facts are germane to that event.

The Court: I will sustain the objection.

Exception.

The Court: I won't take the conversation; if you have any facts that is different.

Mr. Fraser: To make a record of the excluded testimony, we now make formal offer to prove by this witness that in 1897 or 1898 he had conversations with Mr. Leavitt in which Mr. Leavitt asked Mr. Curtis if there was any objection from the standpoint

of a turbine engineer to the mounting of the two stages of the turbine to revolve in contrary directions in order thereby to eliminate any objections as to gyroscopic action that might be inherent in one wheel, or what has been otherwise called an unbalanced turbine; that Mr. Curtis told Mr. Leavitt that there was no objection to it and it was perfectly practical, and that Mr. Leavitt made sketches which he showed to Mr. Curtis illustrating how he proposed to apply these two wheels in a torpedo in order thereby to make what has been called here a balanced turbine.

The Court: That is just it; as you have done before, you are doing it back-handed; if you put Mr. Leavitt on the stand and connect it with the actual transaction of any kind then it presents a different situation.

Mr. Fraser: We will excuse Mr. Curtis now and call him later.

280 FRANK M. LEAVITT, being duly sworn and examined as a witness for the defendant, testifies as follows:

Direct examination by Mr. Fraser:

Q. Where do you reside?

A. Smithtown, Long Island.

Q. Where is your place of business?

A. At the office of E. W. Bliss Company, Brooklyn.

Q. What is your profession?

A. Engineer.

Q. How long have you been connected with the E. W. Bliss Company?

A. Since 1876.

Q. Continually?

A. Pretty nearly.

Q. Please state the extent and nature of your experience concerning torpedo construction?

A. My first experience with torpedoes was in 1890, when I went to the Whitehead works in Fiume, Hungary, to investigate torpedoes, and from then to now I have been pretty constantly connected with it.

Q. During the time the Bliss Company was manufacturing the Whitehead torpedo what did you have to do with the matter?

A. I had general supervision of all that work.

Q. How long were the Bliss Company manufacturing the Whitehead torpedo?

A. They started in 1891 and continued up to about 1900, I think, along there.

Q. Are you the inventor of the torpedo now manufactured known as the Bliss-Leavitt torpedo?

A. I am.

Q. When did you first begin to improve upon the old Whitehead torpedo?

A. In 1897.

Q. What did you first do, what was the nature of your first work in that connection?

A. The first work was to install a turbine; that was the first improvement; the installation of the turbine in the torpedo.

281 Q. Will you describe the construction you first designed and state what you did concerning its development?

Objected to as immaterial to any issue in this case.

The Court: That is pretty broad and pretty general.

By the Court:

Q. What is the date of your torpedo patent in evidence?

A. I don't remember.

Mr. Coles: January 5, 1904, patent No. 748,759.

Q. (Repeated) Will you describe the construction you first designed and state what you did concerning its development?

Mr. Coles: Same objection; it is absolutely immaterial as to what Mr. Leavitt or anybody else did along this matter.

The Court: Go on.

Exception.

A. The design consisted of two turbine wheels revolving in opposite directions, but geared to two concentric propeller shafts; that is the design.

Q. What did you do about constructing that design?

Same objection.

A. I don't understand the question.

By the Court:

Q. Did you construct anything on that plan?

A. Yes, I constructed such a turbine.

Q. Where?

A. I constructed it at the works of the Bliss Company in Brooklyn and tested it at Sag Harbor, New York.

282 Q. Is that the torpedo that the witnesses Dieter and Longacre have testified about?

A. Yes, sir—not Diefier; Longacre verified the drawings.

By Mr. Coles:

Q. That is the design tested at Sag Harbor and it ran away or some accident happened to it?

A. Yes, that is the one; Longacre testified to it.

By Mr. Fraser:

Q. I want to get before the Court a description of that construction; first let me ask you if you identify the drawings which were identified by Mr. Longacre; you have seen these drawings?

A. Yes.

Q. What do you know about the making of those drawings?

A. I know they were made by Mr. Longacre under my supervision.

Q. And about when?

A. About the years 1897 and 1898.

Q. To make that more clear, I ask you to examine these colored drawings and tell what they represent.

Mr. Coles: I object to the witness's attention being called to the colored drawings because it is apparent from a casual observation of them even at this distance that they are prepared in detail and are much more comprehensive in their disclosures than anything which could possibly be inferred by interpreting from the other drawings which have been mentioned in the testimony of Longacre.

The Court: If that is so it may be pointed out on cross examination.

By the Court:

Q. Did you prepare these drawings?

283 A. I had these drawings prepared to illustrate the turbine represented on those other drawings; these were traced from those drawings; and there is nothing here except what is shown in those drawings, except that they are colored up to make it clear, but all the working parts which are shown in these drawings are represented in those other drawings; it is simply that they are assembled and colored up to make it apparent to the eye.

By Mr. Fraser:

Q. By those other drawings you mean the four drawings which were identified by Longacre?

A. Yes.

Q. With reference to the two colored drawings will you explain to the Court the construction and operation of that torpedo?

Same objection.

Mr. Young: The drawing is not in evidence.

The Court: They should be offered either now or later, I don't care which; they go in as part of the witness' testimony.

Exception.

A. There are two turbine wheels rotating in opposite directions on a shaft which runs across the torpedo, these turbines are connected through gearing with the two propeller shafts which revolve in opposite directions; there is a train of gears on each side which connects each turbine to the two shafts, so that each turbine drives each of the two revolving shafts; either one will drive both shafts.

Q. You said the two turbines revolve in contrary directions; how about the two shafts?

A. The two shafts revolve in opposite directions.

Q. What do the colors applied to the wheels signify in the drawing?

284 A. They signify the gears which are driven by each turbine, I suppose; I have not followed through that color scheme, to tell the truth.

Q. The drawing you have in your hand is looking in what direction?

A. That is a plan view; that is looking down on the top of the torpedo.

Mr. Fraser: I offer those drawings as Defendant's Exhibit 126.

Objected to.

The Court: It does not help the testimony much on the witness' own statement.

Q. Please refer to the last drawing again and explain the gearing connections?

The Court: So we will know what he is talking about we will mark that Exhibit 126 for Identification.

Q. On Drawing 126 for Identification please explain the gearing connections and the general mechanical construction?

A. On the shaft of each of the turbine wheels there is a gear which meshes in with a gear, each one meshing with an independent gear, and these in turn mesh with gears on a shaft which runs across, abaft the turbine; attached to the two gears on each side are two miter gears and these miter gears mesh with one gear on the inside propeller shaft and one gear on the outside propeller shaft, so the whole are brought together in one system; in other words, the turbine on the left hand side will drive through the system both the inside and outside shaft, and the turbine on the right hand side will do the same thing through its train of gears.

Q. As I understand you, the two turbines on that drawings are in different colors and the gears that mesh with them are correspondingly colored?

A. Up to a certain extent that is true; the only thing that
285 is not clear to me in your color scheme is that the colors—the yellow drives the red and also the yellow drives the yellow; I don't see how you can convey that with color, what I have just been describing; each turbine drives both shafts.

Q. Referring to the other drawing, which we will call Exhibit 127 for Identification, please tell us in what direction that is looking?

Same objection.

Q. And what the drawing shows?

A. That is the side elevation of the turbine which is shown in the plan in the other view; this shows the side view of these gears with the exception of the beveled gears; it shows the outside view you would see in looking at the turbine.

Mr. Fraser: I offer these two in evidence as explanatory drawings.

Mr. Coles: I object to the introduction on the ground that they are immaterial, irrelevant and incompetent, and have not been shown to have been made by the witness.

The Court: They may be admitted.

They are marked Exhibits 126 and 127 in evidence.

Q. I understood you built a torpedo of the construction shown in these drawings?

A. Yes.

Q. What did you do with it?

A. We tested it at Sag Harbor.

Q. Were you present during those tests?

A. I was.

Q. How did the torpedo operate?

A. It operated all right except that we did not get the speed we hoped to get.

Q. Was the speed faster or slower than the Whitehead torpedo of that date?

A. It was slower.

286 Q. How long did you continue to operate it there at Sag Harbor?

A. I don't remember the length of time of those tests; I suppose they ran over several weeks, probably.

Q. What year was that?

A. I think that was in 1899, as near as I can recollect.

Q. What happened finally to the torpedo?

A. We had some accident with it and we wrecked the engine.

Q. What remained of it was then sent back to the works of the Bliss Company in Brooklyn?

A. Yes, that was sent back to the works.

Q. I now show you Naval Folio A, pages 15 to 25 inclusive, being a report by G. C. Davison to the Bureau of Ordnance, dated April 26, 1902, in which on page 22 of the Folio I find this statement, namely, "The turbine for torpedoes constructed by the E. W. Bliss Company a few years ago was not of the same type as the present one, though the principle was, of course, much the same"; do you know what turbine for torpedoes constructed by the E. W. Bliss Company is referred to in that report?

Mr. Fraser: I offer the report in evidence as Exhibit 101.

Mr. Coles: It is objected to because it is a communication from an officer to his superior in the Navy and is not competent testimony to any issue in this case.

Objection overruled.

Exception.

It is marked Exhibit 101 in evidence.

A. It must have referred to this 1898 torpedo we have been discussing, because that is the only one we had built.

Q. That is prior to the date of that report, Apr. 26th, 1902, other than the particular experimental turbine referred to in
287 the report, you had built at the Bliss works no other than the one turbine for torpedoes that is illustrated in these colored drawings we have been discussing?

A. That is correct.

Mr. Fraser: I offer the blue prints with the report.

The Court: Leave the letter-101 and 102 and 103 will be the blue prints.

Q. I call your attention to Folio B, page 9, being a letter from the E. W. Bliss Company to the Chief of the Bureau of Ordnance

dated October 18, 1901, and ask you if you can identify that as being a copy of a letter from the Bliss Company of which you had knowledge?

A. Yes, sir.

Q. The first paragraph of this letter reads:

"Your letter No. 9558 of October 14, 1901, to the Inspector of Ordnance, U. S. N., at these works, has been handed to us. As the Bureau is already aware, we have done considerable experimenting along the lines of driving the torpedo by means of a turbine, but these experiments were brought to an abrupt termination by the total wreckage of the apparatus, due to an accident. These experiments went far enough, however, to convince us that the turbine is the ideal motor for driving the torpedo, providing its efficiency can be brought up to the requisite point, but we abandoned the work on account of the expense. Since that time, the turbine has been more fully developed, and elaborate tests have shown it to compare favorably in steam consumption with the most economical multiple expansion steam engines."

Do you know what was the experimenting by driving the torpedo by means of a turbine, which is referred to in that paragraph I have just read?

288 Same objection.

A. It refers to the experiments we made in 1898 and 1899.

Q. With that same balanced turbine torpedo?

A. Yes, sir.

The letter is offered in evidence as defendant's Exhibit 128.

Objected to as immaterial, irrelevant and incompetent; there is nothing in the letter to show that it related to the so-called balanced turbine which was wrecked, but on the contrary the correspondence indicates it related to the unbalanced turbine.

Objection overruled.

Exception.

It is marked Defendant's Exhibit 128.

Q. How do you know that the turbine referred to in this quotation is the one that you have described here?

A. Because that is the one we had built several years before.

Q. At that time had you built any other that was wrecked?

A. No, we had not.

Q. When you were designing that balanced turbine what was the source of your information as to the application of the turbine as a propelling means applicable to torpedoes?

A. I was acquainted personally with Mr. Curtis, the inventor of the turbine, and we discussed the matter.

Q. I understand it was the Curtis turbine you used in that early torpedo?

A. It was.

Q. Was the turbine as you applied it in that torpedo the ordinary construction of the Curtis turbine?

Objected to.

Objection overruled.

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Exception.

A. No, it was not.

Q. How did it differ from the ordinary construction?

A. The ordinary practice was to attach the various wheels to the same shaft and rotate them in one direction; the construction of this turbine was different in respect to the way the wheels revolved; they revolved in opposite directions.

Q. Before building that did you take any pains to satisfy yourself that that would be an operative construction?

A. Yes, I did.

Q. How did you go to work to satisfy yourself?

Objected to as calling for the operation of the witness's mind and a conclusion.

The Court: There may be something tangible; what did you do?

The Witness: I was in doubt as to the efficiency of a turbine run that way, and I consulted with Mr. Curtis, who was an expert, to find out if I could run the wheels in opposite directions; he assured me I could.

Mr. Young: I ask to have the answer stricken out.

By the Court:

Q. What did you do then?

A. Then I built a turbine that way.

The Court: Then what difference does it make?

Mr. Fraser: All this goes to corroborate the witness and helps to establish the facts.

Mr. Coles: We contend it is immaterial.

The Court: Go on and I will think about it; let it stand.

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Exception.

Q. Did you yourself design the nozzle and the turbine wheel buckets or blades for that particular construction, or were they designed by some one else?

A. They were not designed by me.

Q. Who were they designed by?

A. They were designed by Mr. Curtis.

Q. Did you get any license for applying the Curtis turbine under the protection of the Curtis patents?

Mr. Young: Objected to as the license will speak for itself.

The Court: Read it.

Q. I show you a paper and ask you if you can identify it, and if so what it is?

A. That is an agreement made between the E. W. Bliss Co. and the Curtis Turbine Co. giving the Bliss Co.——

Mr. Young: Objected to; that is giving the contents of the paper.

By the Court:

Q. That is the license, is it?

A. Yes, sir.

Mr. Fraser: I offer that in evidence.

Mr. Coles: I object to the introduction in evidence on the ground that it is immaterial, irrelevant and incompetent to any issues we have.

Objection overruled.

Exception.

It is marked Exhibit No. 129.

Q. I now show you a letter, and ask you if you identify it, and who wrote it?

A. I wrote it.

Mr. Coles: Same objection.

The Court: To what, to his writing the letter?

291 Mr. Coles: To the question based on the letter.

Q. This letter is from the Bliss Company addressed to C. G. Curtis, and is dated December 8th, 1897; refreshing your memory by this letter can you tell when you consulted Mr. Curtis and got the designs from him?

Objected to as immaterial and incompetent.

Q. Yes, sir, I can.

Q. When was it?

A. It was in the latter part of 1897 we had a number of consultations; I couldn't give each specific one; we met quite frequently.

Q. How much did you disclose to Mr. Curtis of the construction you were then proposing to adopt?

A. All of it.

Q. How did you disclose it to him?

A. By making pencil sketches as we talked.

Q. Were those sketches preserved?

A. No, sir.

Q. Did what you disclosed to him at that time differ in any way from what you afterward built?

A. No, sir, they were practically the same as a rough sketch will be like a finished product.

Q. Leaving the history of that early balanced turbine of yours I now call your attention to a copy of a letter appearing in folio A* on page 5 and ask you if you identify that as a copy of a letter written by you?

A. Yes, sir, I recognize that.

Mr. Fraser: This letter dated October 10th, 1901, signed by F. M. Leavitt addressed to "My dear Mr. Fiske" is offered in evidence as Exhibit 130.

292 Mr. Coles: I insist if counsel is going to put that letter in they should put in the letter of October 11th, 1901, which transmitted this letter to the Bureau.

Mr. Fraser: I have no objection to Mr. Fiske's letter accompanying this one.

Mr. Coles: And also the letter of October 14, 1901, from the chief of the Bureau to the Bliss Company; that letter shows the Leavitt letter and the Fiske letter, and also the letter of October 18, which is Defendant's Exhibit 128.

Mr. Fraser: I have no objection to their all going in.

Pages 5 to 9 are marked Exhibit 130.

Q. In your letter of October 10th, 1901, to Mr. Fiske discussing the turbine you say "From the experiments we have already made I believe the turbine holds out great possibilities." What did that refer to?

A. It refers to the 1898 turbine.

Q. Do you know whether an experimental turbine was constructed for the Bureau of Ordnance by the Bliss Company on that requisition?

A. It was.

Q. Who designed that turbine?

A. I did.

Q. State when that was built, if you know?

A. 1901 and 1902, I think.

Q. I show you defendant's Exhibit 50, being your own patent No. 748719, the application for which was filed October 6, 1902, and I ask you whether the construction of that experimental turbine was similar to or different from that?

A. These drawings of the patent were made from the working drawings of that turbine.

Q. When that experimental turbine was built how was it tested or operated?

A. It was tested in the dynamometer.

Q. Was it put into a torpedo?

A. No, it was not.

Q. Was it connected to any part of a torpedo?

293 A. Well, yes, sir. I say it was not put in a torpedo, I mean it was not put in a working torpedo; it was put in the after body of a torpedo in order to make a test.

Q. And connected up with the air flask?

A. Yes, connected up with the air flask, but not as an operating torpedo.

* Q. So that it was tested with a dynamometer under normal testing conditions?

A. Yes, sir.

Q. Was any naval officer present at any test of that?

A. Yes, sir, Lieut. Davison.

Q. I show you folio A, page 15, being Exhibit 101, and ask you if that is the report of Lieut. Davison concerning the test of that particular turbine?

A. The report evidently refers to that turbine.

Q. Referring to that reference in this report to the earlier construction will you please tell, if you know, how Lieut. Davison learned about that earlier construction?

A. I suppose he learned it from me; we have had conversations on the subject; I told him about that torpedo.

Mr. Coles: I except to the answer as being indefinite; it shows the witness has no knowledge of how the information was obtained; the witness says he supposes.

The Witness: I can change that.

The Court: Go on.

A. Mr. Davison and I had several conversations in regard to this matter while he was testing the turbine in which I mentioned to him the construction of that machine.

By the Court:

Q. You say it was embodied in your patent?

A. That particular construction was not embodied in the patent.

294 By Mr. Coles:

Q. The unbalanced type which was being tested and on which that report was made is substantially like the figures in your patent?

A. The patent is based on the type of turbine being tested at that time, and that was the unbalanced type of turbine; in other words, we had abandoned the balanced type and come to this other.

By Mr. Fraser:

Q. During those tests of the unbalanced turbines you were then testing you made some explanation to Mr. Davison of the earlier balanced type?

A. I did.

Q. Will you tell us what you can remember of what you told him concerning that earlier type?

A. I can't remember conversations in detail that occurred 10 or 12 years ago; I can only remember the general drift of the conversation, that we did discuss all matters of turbines, in regard to these tests and what we had already done; we went over that whole ground; I naturally can't give details of the conversations.

Mr. Coles: I move to strike out the answer as incompetent.

By the Court:

Q. Do you state positively that you disclosed to Mr. Davison the details of the construction of this torpedo you have been testifying about, the experimental torpedo?

A. Just how far I disclosed them I can't say.

The Court: Strike it out.

By Mr. Fraser:

Q. What do you remember that you did tell Mr. Davison?

295 A. I can't answer that specifically; all I can remember is the general discussion of the subject; Mr. Davison was coming there for some days testing that torpedo.

The Court: It is immaterial unless you know what you told him.

The Witness: I can't remember any specific conversation at that time.

Mr. Coles: I move to strike out the testimony.

The Court: It is already stricken out.

Q. What was done with that experimental torpedo you and Davison tested at that time?

A. It was sent to Newport.

Q. What did you next do in the way of building a turbine driven torpedo?

A. I started in to design and build a new torpedo.

Q. At any time during any of these experiments had you made any test to determine whether there was any gyroscopic action on the turbine?

A. Yes, sir.

Q. What was that, and how did you make the experiment.

Same objection.

A. The experiment was made by suspending a torpedo so it was free to swing, and running the turbine at full speed to see if there was any effect of a gyroscopic nature, and I came to the conclusion that while there was theoretically that in the action of the wheel revolving it was so small as to be inappreciable in practice.

Q. That is, from that test you could not notice any gyroscopic effect?

A. Couldn't notice any at all in that test.

Q. What particular structure did you use in making that test?

Same objection.

A. I used the torpedo, suspended a torpedo.

296 Q. Which particular turbine construction did you use?

A. I used the——

By the Court:

Q. Where and when was this?

A. At the works of the E. W. Bliss Co. I can't place the exact date but it was in those early days before I built any torpedoes for the service.

Q. Prior to what date?

A. Prior to—I think prior to 1903.

By Mr. Fraser:

Q. With what particular structure did you make that test?

A. I can't remember whether it was made with the turbine that was the subject of this report, or whether it was made with the turbine that I built there; I can't remember which, though it might be one or the other.

Q. If it was the former of those then it was made before it was shipped to Newport?

A. Yes, sir.

Q. And if it was the other then it was how long afterward?

A. Within a year or two.

Q. Can you fix the date with reference to that patent of yours?

A. It was before this patent was filed, which is October, 1902; it was before this patent was applied for.

Q. I refer you to folio A, page 32, being a letter from Charles O'Neill, Chief of the Bureau of Ordnance, to the inspector of Ordnance at Newport, dated September 2, 1902; in that letter it is stated "The Bliss Company has well under way a turbine torpedo which they propose to submit to the Bureau when completed; the turbine is similar to the experimental turbine; the exhaust will be through the after body and tail shaft; the after body has less taper, i. e., is larger at the tail end on account of the increased diameter of the shaft; this gives an exhaust three inches in diameter.

297 Mr. Leavitt has a new design for every auxiliary of the turbine with the exception of the diving gear, etc." Can you tell what turbine torpedo that refers to?

Same objection.

A. That is the torpedo we built just after the one which was sent to—after the turbine was built which was sent to the torpedo station.

Mr. Fraser: I offer the letter as Exhibit 131.

Mr. Coles: Objected to as incompetent because it is only a communication from the Bureau to one of the officers.

Objection overruled. Exception.

It is marked Defendant's Exhibit 131.

Q. I refer you to folio B, page 16, which purports to be a copy of a letter from the E. W. Bliss Company to the chief of the Bureau of Ordnance dated September 15, 1903, and ask if you identify that letter?

A. Yes, I do.

Mr. Fraser: That letter I offer in evidence as Exhibit 132.

Mr. Coles: Objected to because it is not shown to have any bearing whatever on the balanced turbine and relates to the earlier development of the unbalanced turbine type, and is not the present type of torpedo.

The Court: Mark it 132.

Exception.

Mr. Fraser: It seems, your Honor, a Board was appointed and did see the tests of that torpedo, and we find the report of the Board in Folio B, beginning at page 18 and continuing to page 37. That report I offer as Exhibit 133.

298 Q. Mr. Leavitt, this report is signed by W. Irving Chambers, Lieutenant Commander, U. S. N.; W. J. Sears, Lieut. Commander, U. S. N., and F. K. Hill, Lieut., U. S. N.; did you meet those gentlemen and attend with them at any of the tests referred to in this report?

A. Yes, sir.

Mr. Coles: Objected to because the report of the Board is immaterial, irrelevant and incompetent to any issue in this case, the report relating to the development of the unbalanced turbine and not to the balanced turbine.

A. I attended all those tests.

Q. How did that torpedo behave during those tests?

A. It behaved very well.

Q. Was there any sheer?

A. I don't recall a single sign of it.

Q. How straight a course did it run?

A. It ran—I don't remember the exact amount of deflection, but I do remember it ran straight enough to satisfy the Board to order the torpedo. What I mean is I can't remember the exact amount of deflection from a straight line that the torpedo made; that is a matter of a few yards, I suppose.

Q. This report says that in one case at least the torpedo made a bull's eye; what does that mean?

A. It means it went into the center of the target.

Q. Could it run through the center of the target if it had made any sheer?

A. No, it would be likely not to.

The Court: It might have made a sheer and recovered, might it not?

The Witness: Yes, that might be.

Mr. Coles: It might hit the bull's eye by accident too?

The Witness: Yes.

299 Q. The report says, "The torpedo under control of the gyroscopic steering device is as accurate as the Whitehead during the straight runs and is comparatively more reliable than the air controlled gyroscope from the fact that the motor for moving the vertical rudders is a positive mechanical device, free from the possibility of danger from particles of grit in the air passages." Does that statement of the report that the torpedo is as accurate as the Whitehead assist your recollection at all as to the performance?

Same objection.

A. I know that the torpedo went straight. It ran well. I think I misunderstood your former question.

Q. I don't think there has been any misunderstanding. Did you discuss with the members of that Board any of your earlier work in turbine driven torpedoes?

Objected to as immaterial.

A. I don't remember that.

Q. This report says under the heading, "Gyroscopic Action of Turbine":

"In this torpedo the turbine revolves about an axis coinciding with that of the torpedo. An effort on the vertical rudders should cause the torpedo to dive or rise. An effort on the horizontal rudders should tend to cause the torpedo to swerve to right or left."

State whether what is there stated is the same as what you have before referred to as gyroscopic action?

A. Yes, sir.

Q. The same thing?

A. Yes, sir.

Q. (Continuing:) "As the torpedo makes a sinuous course
300 during a run, any tendency of the gyroscopic energy of the turbine to disturb its accuracy should be apparent during a run. During the trials at Sag Harbor and Newport, the torpedo seemed to be under perfect control and accurate, and apparently the gyroscopic energy of the turbine did not disturb the accuracy. It is impossible to say whether any greater disturbances would be produced during a curved run with wide angle fire, as the gear as at present arranged would not permit of such a run. If, however, in future trials, such a disturbance should be experienced, a feasible and practicable remedy would be to substitute for the one turbine a pair of twin turbines revolving in opposite directions, geared together and to the main shaft."

Do you know or can you recall anything being said that would have suggested that last statement or remark?

A. No, I don't recall it.

Q. The Board—according to this report, recommended the acceptance of the torpedo and the placing of an order; do you know whether such an order was placed with the Bliss Company?

A. It was eventually; it was after some little interval of time.

Q. What torpedoes were ordered?

A. As I remember it, there were two torpedoes with 21 inch diameter and 50 with 18 inch diameter.

Q. And were those constructed by the Bliss Company?

A. By the Bliss Company, yes, sir.

Q. And the turbine mechanism of those was the same as in the torpedo tested by the Board?

A. Yes, sir, just the same.

Q. And identical with the construction shown in your patent Exhibit 50?

A. Yes, sir.

By Mr. Coles:

Q. The unbalanced turbine?

A. Yes, sir.

By Mr. Fraser:

Q. At the time you designed the so-called unbalanced
301 turbine mechanism what led you to select the unbalanced turbine rather than the balanced turbine you had previously built?

A. I came to the conclusion there was nothing in the balanced turbine as far as it affected the action of the turbine. That is what led me to do it, because I didn't think there was anything in balancing the turbine, that there was any advantage; that is why I did it,

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and I will amplify that; because at that time it seemed a simpler design.

By the Court:

Q. The engine itself?

A. Yes, sir, it was a simpler design of engine as I saw it then.

By Mr. Fraser:

Q. That conclusion of yours resulted from the test you made as to the gyroscopic action of the turbine?

A. Yes, largely from that; mostly from that, and from studying over the effects; that is mathematically studying over the effects; I couldn't see that it would be appreciable.

Q. That is, if I understand you correctly, the gyroscopic tendency to deviation was so slight in proportion to the whole mass of big heavy torpedo you thought the gyroscopic effect would be negligible?

A. That is it exactly.

Q. So you adopted the unbalanced form because you believed it had mechanical advantages over the balanced?

A. Yes, sir.

Mr. Coles: After the second question above there should be an objection. Objected to as testifying in the form of a question.

The Court: It certainly is. Mr. Leavitt invented the torpedo and ought to be able to describe it himself.

302 Q. When did you first encounter any difficulty with what has been called the sheer of the torpedo?

A. I think the first difficulty was encountered with the first of the 50 torpedoes which I built, which I referred to a few minutes ago; I think we began to have trouble with that sheer, with those torpedoes as I remember.

Q. Can you give any idea of the time when that occurred?

A. I don't remember when it commenced, but it was those torpedoes; I can't fix that date very well now; I don't remember the date of that.

Q. When you first tested the 18 inch torpedoes made under that first contract, at Sag Harbor, did you have any trouble with the sheer?

A. I remember that the first few shots we did not; then it commenced to develop; we had trouble ever after for a long time.

Q. What was your inference from the fact that the first torpedo tested by that Board in 1903 developed no sheer, and the first torpedo built under the first contract for 18 inch torpedoes at first developed no sheer, and later it did develop a sheer?

Objected to as immaterial, irrelevant and incompetent.

The Court: He may answer.

Exception.

A. Well, there were all sorts of theories advanced on this.

The Court: You are asked to select your own.

A. I had so many that I couldn't say; we were utterly at sea at that time.

Q. Let me put it another way; from those facts did you have any inference as to whether the sheer was due to the unbalanced turbine or not?

303 A. I was always of the opinion it was not; there were all sorts of opinions expressed, some that it was and some that it was not; everybody had an opinion; my opinion always was that it was not due to that.

Q. Was the difficulty and its explanation the subject of considerable discussion between yourself and naval officers?

A. Yes, there was no end to the discussion between the navy men and myself and everybody concerned.

Adjourned to 10:30 November 19th, 1913.

BROOKLYN, November 19, 1913.

Met pursuant to adjournment, as before.

FRANK M. LEAVITT resumes the stand.

By Mr. Fraser:

Q. Defendant's Exhibit 117, Folio F, p. 25, being a letter from Mr. McCormick to the Chief of the Bureau, dated December 11, 1906, refers to "a visit this day of Assistant Inspector Yamashita of the Japanese Navy." Do you remember that visit?

A. Yes, I do.

Q. The letter says that a balanced turbine, built by the E. W. Bliss Company, was inspected by this Japanese officer. It also says that in response to inquiries Mr. Leavitt stated that this was an experimental turbine. Please state first what was the turbine that was seen by Mr. Yamashita on that occasion?

A. That was the first balanced turbine which we built for that lot of torpedoes. It was an experimental turbine.

By the Court:

Q. By "that lot" do you mean the Government order?

304 A. It was built with a view to putting it into that lot of torpedoes; that is, it was an experiment.

By Mr. Fraser:

Q. That was the lot of torpedoes built under the contract of 1905?

A. Yes.

Q. Please state your recollection of just what occurred on that occasion.

A. I recollect going through the works with this Japanese officer, showing him various parts of the torpedo, until he happened to get his eye on this engine and asked some questions; I don't remember in detail, I simply passed him along; that is, I told him it was experimental, and walked him along, as I remember it.

Q. Do you remember Mr. McCormick being present on that occasion?

A. I think he was, yes; I am quite sure he was.

Q. Please state what you know as to the construction and testing of that particular balanced turbine?

A. The turbine was tested at the works during my absence at Sag Harbor; it was put into a torpedo and sent to Sag Harbor and put through service tests in my presence.

Q. Was any naval officer, or were any officers, present during those tests?

A. There were.

Q. Who?

A. Lieutenant Delaney, who was the inspector in charge at Sag Harbor, and several gunners.

Q. What was the result of those tests, so far as the sheer was concerned?

A. The service tests of the torpedo showed that we had not overcome the sheer; the first shot we made, if I remember, the torpedo sheered quite badly; subsequent shots were some of them good, and some of them bad. I don't remember them in detail.

Q. As far as the sheer was concerned was this particular torpedo, with the balanced turbine, any better, perceptibly, than the
305 preceding ones with the unbalanced turbine?

A. I couldn't see any difference.

Q. What conclusion did you arrive at from those tests, as to the sheer?

A. The conclusion I arrived at was that the tests substantiated my claim that the balance had nothing to do with it.

Q. I show you now a blue print, being Defendant's Exhibit 28, and ask if you have ever seen that before, and if so, when and where?

A. I saw that in my office at the works of the Bliss Company in January, 1907.

Q. Did any letter accompany it, that you know of?

A. Not that I recall.

Q. How did that drawing come into your hands?

A. I found it on my desk in the morning when I came to the office.

Q. What did you do with it?

A. I examined it to see the details of construction, and laid it aside in the drawer in my desk.

Q. You recognized it as being a naval design, did you?

A. I did.

Q. At that time what, if anything, were you doing regarding a balanced, or so-called balanced or counter-rotative turbine for the Bliss-Leavitt torpedo?

Mr. Coles: Objected to as immaterial, having no bearing upon the issues in this case.

The Court: What do you mean? Before January the 7th, or after?

Mr. Fraser: I mean the day he received the drawing; what they were doing in that direction.

The Court: He may answer that.

Complainant excepts.

A. We were at work in the shop altering the engines; we had commenced altering the engines of the torpedoes which we
306 had previously built, to conform to the experimental turbine which we had built the year before; that is, in 1906.

Q. Were those that you were then altering exactly like the experimental turbines of November, 1906 or was there a difference?

A. As near as I can remember it was the same. I don't remember that we made any changes.

Q. Who designed the construction for the final alterations for work under the contract?

A. Mr. Dieter.

Q. Did you have anything to do with it?

A. Nothing, except to advise on a few points.

Q. When you received this naval blue print did you make any comparison of that with the design that you say was then under construction?

A. I did.

Q. Please state how the two designs compared. To assist you in that let me ask you to look at the blue print I now show you and state what it illustrates. First, what does that drawing represent?

A. This drawing represents the design of engine which we were at that time commencing to build, or rather, alterations of the old engine to this design which we were commencing to carry on to instal- in the torpedoes.

Q. In other words, does that drawing show the construction or so-called balanced turbines as you actually applied it in the torpedoes furnished to the Government under that 1905 contract?

Objected to as leading and immaterial.

The Court: He may answer.

Complainant excepts.

A. It does.

Q. Please compare this design with the one shown in the naval blue print.

Mr. Fraser: We will mark the exhibit last submitted, as Defendant's Exhibit 134.

307 Mr. Coles: I object to its introduction on the ground that it is immaterial, irrelevant and incompetent.

Objection overruled.

Complainant excepts.

Mr. Coles: I further object to this paper being received in evidence on the ground that the only date it appears to bear is October 3rd, 1907, and this date is sufficient to demonstrate that it is immaterial to any issue in this case.

The Court: Mark it for identification.

A. Those two designs are very similar in general appearance, and were both based on the same original design; that is, they are two designs made of alterations of the same machine by different people; so that they have a general appearance of similarity; but there are two features in which they differ very radically. I will try to make that clear. Our design (134 for identification)—in our design the forward turbine revolves upon a stationary shaft which is held at its forward end in the bulkhead, and its after end is carried by a framework attached to the shell of the after body.

By the Court:

Q. Do you know anything about that drawing?

A. Yes, sir.

Q. What do you know about it? Was it made under your direction?

A. This drawing was made from the working drawings of the torpedo. Our practice is to make our rough working drawings, from which we build the machines, and afterwards make a finished set of drawings which we submit to the Government. They generally come along after our working drawings. We have to
308 furnish to the Government a set of drawings before we deliver the material showing the construction, and these drawings are generally made about the last thing. That is what this drawing is; it is a copy of the drawing which was submitted to the Government as the final construction.

Q. Have you got the original drawings?

A. Yes, sir.

The Court: Let us see them then. When were they made. Suppose you put on the man who made these drawings. Mr. Dieter made them, didn't he?

The Witness: They were made under his supervision.

By Mr. Fraser:

Q. Let me ask you if this blue print, except for the coloring, is identical, being from the same drawing, the same tracing, as blue prints that were furnished to the Bureau of Ordnance during the delivery or prior to the delivery under that contract of 1905?

Objected to as leading.

The Court: Where are those drawings?

By the Court:

Q. You wouldn't mail a drawing without any letter, would you?

A. No. We would send a letter with it simply saying that we enclosed blue prints for approval; we have so many of those letters that it would be difficult to find it.

The Court: Well, I know; but you must prove the case.

By Mr. Fraser:

Q. I hand you a series of tracings. Will you please look at these

309 tracings and state if you know what they are and what they show, and when they were made?

A. These are the various details showing the construction of that engine, that balanced turbine which we put into the torpedo.

By the Court:

Q. What date do they bear?

A. They bear dates from February 28, 1907, along through March of the same year; these were made in the same way as the others.

Q. After the event?

A. After the event, yes, sir. We generally start work from pencil drawings, which are sketches, and put that work in the shop when we are in a hurry, and we were in very much of a hurry in this case, and the drawings were made while the work was going on; after it was started. That is our practice.

By Mr. Fraser:

Q. State whether these blue prints were furnished to the Bureau of Ordnance?

A. They were.

Q. About when?

A. I can't say when; some time after this date. We generally prepared a number of these drawings.

Mr. Fraser: To make it clear what the defendant wishes to offer I again ask the witness to state the comparison of the naval design, as shown in Exhibit 28, and the Bliss design as shown in the colored blue print last marked for identification Exhibit 134.

Objected to.

Objection sustained.

Exception.

Q. Please explain what differences there were between the design shown in the blue print Exhibit 28 and the construction that was in progress at the Bliss works on the date when you received the blue print?

310 Mr. Youngs: Objected to on the same grounds.

Objection overruled.

Complainant excepts.

A. In the design which we had under way the forward turbine was mounted to revolve on a stationary shaft which was held at one end by the bulkhead and at the other end by a frame which was attached to the shell of the after body; so that turbine revolved freely on this stationary pin, or shaft; whereas in the design Exhibit 28 the forward turbine was mounted rigidly on a revolving shaft which turned in bearings at one end; one bearing was carried by a bulkhead and the other bearing was carried by a frame attached to the shell of the torpedo. There was one other difference. In

our design the after turbine revolved on a fixed bearing carried by the frame attached to the shell of the torpedo, and was entirely independent of the forward turbine. In the other design (Exhibit 28) the after turbine revolved upon the shaft on which the forward turbine was mounted, so that the relative speed of the two shafts was twice the speed in which the forward turbine shaft revolved in its bearings. In other words, the speed of the forward turbine in its bearings was about 10,000 revolutions a minute, and the speed of the after turbine with relation to the forward turbine was about 20,000. Those are the main differences in design. They are the differences which, in my mind, made the difference between success and failure.

Q. As to the first of those differences which did you consider the best construction, and why?

A. I considered ours the better construction, because in designing a torpedo attention has to be paid to strains in regard to the lightness of the parts; the torpedo is constructed with extremely
311 light parts. They are liable to spring and get out of alignment. That is necessarily so from the amount of power that we transmit and the weight we put into it. The consequence is that the navy design would give the opportunity for the bearings heating and cutting and giving trouble in operation. There was no chance for the parts to spring and get out of alignment without causing trouble; whereas in our design, by carrying the turbines each independently of the frame, they would run without giving that trouble. In other words, we made allowance for the fact that the parts are liable to spring; putting into turbines about 120 to 150 horse power, and the parts being extremely light, the design has to be made to recognize that fact, that you cannot make the parts rigid enough to sustain the strain, and it must be done by proper designing.

Q. As to the second of those differences which did you consider the better design, and why?

A. I considered the Bliss Company's design better in respect to revolving the turbines on an independent stationary shaft, because two shafts revolving at 20,000 revolutions and transmitting the power that we have to transmit through those shafts, to my mind was not good construction, and liable to give trouble, due to the great speed.

Q. That speed, the difference in speed, was reduced one-half in the Bliss torpedo, was it?

A. It was reduced one-half.

Mr. Fraser: Now, if the Court please, we have no structure showing that Bliss design of so-called balanced turbine. The only thing we have to offer is the tracing or the blue print from the tracings, showing that; and in order to get something before the Court illustrating that construction I again offer in evidence the colored
312 blue print which the witness has identified, and which he has testified shows the identical construction that there was at

that time under manufacture, and that was supplied to the Government.

Objected to.

The Court: When you prove it properly I will admit it; but not before. If you don't go any further than you have now, you will have to stand on the witness's testimony.

Exception.

Q. Did the Bliss Company ever construct or manufacture the form of balanced turbine shown in the naval blue print Exhibit 28?

A. They did not.

Q. As far as you know did the Bureau of Ordnance ever request or instruct the Bliss Company to build that construction?

A. They did not.

Q. As you understand that construction what is the relative rate of rotation of the two turbine wheels?

The Court: Now you are talking about Exhibit 28?

Mr. Fraser: Exhibit 28.

A. The relative rotation of the wheels as regards each other?

Q. Yes.

A. About 20,000 revolutions a minute.

Q. I don't mean that. I mean the wheels turn in opposite directions. Do they turn at equal speeds, or at unequal speeds?

A. They turn at equal speeds.

Q. That is the case with the naval blue print design?

A. Yes.

Q. Now with the design that you had under construction at the Bliss works at that time what were the relative speeds of the wheels? Were they equal or unequal speeds?

A. The after wheel turned at a less speed than the forward.

313 Q. What was the ratio?

A. I don't remember the ratio.

Q. Can you state approximately the ratio?

A. I think about in $\frac{3}{4}$ of the time; the after wheel turned in about $\frac{3}{4}$ of the speed of the forward; something like that.

By the Court:

Q. What is the case in the existing type?

A. In that type they revolve at the same speed.

By Mr. Fraser:

Q. As to the so-called balanced turbine that was supplied to the Government in the torpedoes under the 1905 contract, did those turbine wheels revolve at equal speeds, or at unequal speeds?

A. At unequal speeds.

Q. And about the same ratio that you have stated?

A. At about the same ratio that I have stated.

Q. One of the witnesses for the defence testified, if I remember correctly, that under that 1905 contract the torpedoes first built with the unbalanced turbines could not reach the range required, of 3500 yards. Will you please state whether after the change to

this so-called balanced turbine, the Bliss Company did succeed in bringing the torpedoes up to the range of 3500 yards?

A. They did not.

Q. What was eventually done concerning that deficiency of range?

A. The specifications for range were reduced to 3000 yards and the Company was penalized about \$600 a torpedo for the reduction in range.

Q. That was the fact notwithstanding the introduction of the so-called balanced turbine, was it?

A. That is right.

Q. I now show you Exhibit 29 and ask you if you have ever seen it before, and if so when?

314 A. I haven't seen that before, except since this trial began.

Q. Was that letter, bearing date January 2nd, 1907, never seen by you at the Bliss Company's works?

A. Not to my knowledge.

Q. Please turn that letter over and read the endorsements and state whether you know, whether you recollect having received those?

A. I never did.

Q. If that letter and the endorsements were received by the Bliss Company at or about the dates they bear, to whom should they have come?

A. Well, they should have come to either Mr. Page or myself.

By the Court:

Q. In the regular course of business?

A. Yes, in the regular course of business.

By Mr. Fraser:

Q. In the regular course of business they should have come under your notice, should they?

A. Yes.

Q. When did you first learn that the Bureau of Ordnance contended that the so-called balanced turbine was under the secrecy clause 19th of the 1905 contract, or any of the succeeding contracts?

A. About two years ago; some time in 1911, when we had some correspondence in regard to Japanese business.

Q. Are you familiar with the contract of June 12, 1912, which is in evidence as Defendant's Exhibit 2?

A. I am.

Q. What type of construction of Bliss-Leavitt torpedo do you understand to be the one referred to in that contract?

A. That is the contract of June 12th?

Q. Yes, the contract of June 12, 1912.

A. That is the Mark 7.

315 Q. Is the torpedo, or are the parts of the torpedo here in evidence as Exhibit 27, a specimen of that particular construction of torpedo?

A. That is one of the torpedoes built under that contract.

Q. About when was that particular torpedo designed, and by whom?

A. That was designed by me; as to when it was designed I cannot place a definite date, because it was partly from a Mark 6 design, which was built before with some new features in the way of motion and so on. It is a modification of a former design.

Q. In this Mark 7 design the turbine wheels are arranged in a horizontal plane turning upon a vertical axis. Was that a new feature to this Mark 7, or had it been in Mark 6?

A. It was in Mark 6.

Q. With the turbine wheels located in that horizontal plane, what difference in effect is there as compared with the location of the turbine wheels in a vertical plane and as in the previous torpedoes, namely, those containing a so-called balanced turbine of the 1905 contract? Please answer that with reference both to so-called balanced turbines and to so-called unbalanced turbines.

Mr. Coles: Objected to as immaterial, on the ground that a mere change in the location or form does not constitute a departure from the design either of blue print 117E, Exhibit 28, or from the Davison patent.

The Court: I will hear the answer.

Exception.

A. As far as the location of the turbine wheels themselves is concerned there is no difference at all. If that question is meant to include the whole of the apparatus there is a difference; that is, the difference in the location of the nozzle does make a difference. As far as the wheels themselves are concerned there is no difference at all.

316 Q. You are referring now to the so-called balanced form?

A. To all of them. I refer to them either way. When I say there is no difference I mean there is no appreciable difference.

Q. You are referring now, I suppose, to the reactive effect at the nozzle?

A. If the nozzle is taken into account that is what I refer to.

Q. What is the difference then in the reactive effect at the nozzle between the two arrangements of turbine?

A. The nozzle in the former construction is placed in such a position that the reaction of the air tends to rotate the torpedo. In other words to make it roll, or rather to heel, when freely suspended in space; that is, before the torpedo strikes the water. In the other design—that is, the Mark 7 design, the location of the nozzles is such that there is no appreciable tendency to cause this rolling; in other words, it is so near the center and athwartships that it doesn't, in practice, cause the torpedo to roll.

Q. By the former construction you mean the so-called Mark 3, supplied under the 1905 contract?

A. Yes, I mean the so-called Mark 3.

Q. Please explain a little more fully what you mean by the nozzle reaction.

A. When air flows out of a pipe or a nozzle it tends to make the nozzle move in the opposite direction from that in which the air is traveling; there is a reaction. In the first type, Mark 3, of the torpedo, the direction of this reaction is such that it causes the torpedo to roll. It acts tangentially to the diameter of the torpedo; whereas the same reaction in the Mark 7 type, being almost directly across the center, or nearly across the center, does not in practice cause this rolling.

Q. By the center you mean what center?

A. The main center of the torpedo; the center line.

Q. The main axis of the torpedo itself?

A. The main axis of the torpedo itself.

317 Q. Now in respect of that nozzle reaction how does the Mark 7 construction compare with the construction in your 1898 torpedo-

A. It is very nearly the same; the similarity between those two is much closer than between the Mark 7 and the Mark 3.

Q. That is, in both the 1898 torpedo and the Mark 7 the turbine wheels revolve in a plane parallel to the main axis of the torpedo; is that right?

A. Yes.

Q. And on a rotative axis transverse to the main axis of the torpedo?

A. That is right.

Q. While in the Mark 3 type the turbines revolve on an axis coincident with the main axis of the torpedo?

A. That is correct.

Q. Now please compare that nozzle reaction with the unbalanced type of turbine that you had in 1905 or 1906, with the turbine arranged as in the Mark 7, but assuming this latter to be unbalanced; that is to say, that the two wheels are fixed together and turn both in the same direction.

A. The nozzle reaction in the Mark 3 type is the same whether the turbine is balanced or not; but where the turbine is balanced it introduces a force in the opposite direction, which tends to counteract the reaction of the nozzle. In other words, where in the Mark 3 type the reaction of the nozzle in an unbalanced turbine would cause it to roll or heel while freely suspended in the air, in the balanced turbine that rotative force is counterbalanced, or practically counterbalanced so that there is no appreciable tendency to roll under the same conditions.

By the Court:

Q. And therein lies the utility of the balance?

A. Therein lies the utility of the balance. That is in Mark 3 torpedo. Now in the Mark 7 torpedo the change in the position of the nozzle throws out that difference; in other words, it doesn't make any difference in the Mark 7 whether the wheels are balanced or not; because whether they are balanced or not we don't get that roll; the balance in the torpedo has nothing

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to do with the case in the Mark 7 type on account of the location of the nozzle.

By Mr. Fraser:

Q. Does the location of the turbine wheels have anything to do with that effect in the Mark 7?

A. No appreciable effect, the location of the wheels themselves.

Q. What importance do you attach to the fact that the turbine wheels in the Mark 7 construction are placed to turn in a horizontal position, whereas in the Mark 3 construction they turn in a vertical plane.

Mr. Coles: Objected to as leading, as the witness has just stated that the change in the location of the wheels themselves can produce no difference in effect.

The Court: He may answer.

Complainant excepts.

A. As far as the location of the wheels show any action the revolving mass of the wheels may have on the torpedo there is no appreciable difference; but there is a difference, because the change in the position of the wheels necessitates a change in the position of the nozzle, and the change in the position of the nozzle does make that difference.

Q. To make the distinction clear let me ask you to take first the case of the so-called unbalanced turbine in the vertical plane running around the major axis of the torpedo itself and state
319 in what direction the nozzle reaction acts?

A. It acts in a direction tangentially to the circumference of the torpedo in an opposite direction from which the air is blowing out of the nozzle.

The Court: It couldn't operate any other way.

Q. Compare with that the case of a single or unbalanced turbine located as in your 1898 torpedo; what then is the direction and tendency of the nozzle reaction?

A. The tendency of the nozzle reaction would be to move the torpedo bodily sideways; there is no tendency to rotate it because the nozzle is practically across the axis of the torpedo; any tendency therefore would be simply to move the torpedo sideways bodily.

Q. Around an axis coincident with that on which the turbine revolves?

A. Yes, to some extent.

Q. Approximately that?

A. Yes.

Q. Take the case of the Mark 7 torpedo where the turbine is arranged horizontally, but somewhat further removed from the major or center axis of the torpedo itself; what in that case, assuming a single turbine wheel, is the direction and tendency of the nozzle reaction?

A. It is practically the same as with the 1898 torpedo; that is, it is a little further from the center, but not sufficient to be noticed appreciably in actual practice.

Q. So that with the turbine wheel turning around a vertical axis the tendency of the nozzle reaction is to move the torpedo, as a whole, in what direction.

A. In the opposite direction from which the air is blowing from the nozzle reaction.

Q. If that movement were perceptible in what direction would it occur?

A. In a horizontal plane; that is, the axis of the torpedo would be moved around horizontally; the torpedo would not roll on its axis.

320 Q. That is, the torpedo would swerve, without a roll; is that right?

A. Yes; it would swerve bodily.

Q. And that tendency can be corrected in what way; in actual running?

A. You are speaking of which type?

Q. If it should occur in a Mark 7 type with a single turbine how, if in any way, would it be corrected in actual running?

A. It wouldn't be necessary; the length and weight of the torpedo would be such that there would be no appreciable tendency to rotate it; that is a theoretical point; there is no practical tendency to move the torpedo at all.

Q. Then, if I understand you correctly, the tendency is so minute in comparison with the mass of the torpedo that it is negligible.

A. It is negligible in practice.

Q. Do you know whether any experiment was made to determine what would be the effect with the Mark 7 turbine, if it were changed from the existing type to a so-called unbalanced turbine?

A. Yes; I made an experiment with this in view.

Q. What did you do?

Mr. Coles: I object to the testimony on this point as not having been shown when the experiment was made; therefore it doesn't appear to be material. If it were a fact that such an experiment had been made after this suit had been brought, what would your Honor say about the propriety of such an examination without fixing some date?

By the Court.

Q. When did you make this test?

A. Six or eight months ago; some time through the summer; I don't remember just the date.

321 The Court: He may answer.
Complainant excepts.

Q. Please describe the experiment.

A. I removed the upper wheel from a Mark 7 Torpedo and added sufficient weight to the lower wheel to make it weigh as much as the two wheels weighed together; that is, to make the revolving mass equal to the two. Then I mounted the torpedo in a manner which would allow it to roll freely, and put a tachometer on to test the speed, and ran the torpedo under these conditions, and

found that by changing the position of the torpedo as to the vertical plane it made no change as to its rolling; it had no tendency, either from the gyroscopic action or from the nozzle reaction, as far as my test showed, to make any appreciable motion of the torpedo.

Q. How fast did you turn the turbine at this time?

A. The turbine was running at probably 9 or 10 thousand, I think; 9 or 10 thousand revolutions I think we ran; about up to its working speed.

Q. About the same speed?

A. About the same speed.

Q. With reference to the negligibility of that rolling tendency please state approximately the weight of the whole torpedo and the weight of the turbine wheels?

A. The Mark 7 type torpedo weighs about 1500 pounds and each of the wheels weighs about 10 pounds I should say.

Q. Please look at the letter Exhibit 51, and the accompanying blue prints, Exhibits 52 and 53, and state if you recognize those?

A. Yes, I do.

Q. What was done regarding that ball bearing construction?

A. We adopted the ball bearings in a number of the torpedoes being made at that time; that is, we used that design of bearing.

Q. Was that design used at the request of the Bureau of
322 Ordnance?

A. Not at their request, no.

Q. The Bliss Company incorporated that design of ball bearing furnished by the Bureau in the construction of a certain number of torpedoes under the contracts, and with the approval of the Bureau?

A. We were having some trouble with our ball bearings, and the Bureau informed us that they were getting better results than we were, and sent us the drawings so that we could use it if we saw fit; which we did.

Q. What was the result of the use of that particular construction or design of ball bearings.

Mr. Coles: Objected to as immaterial.

Q. How did they do the work?

A. They worked all right for that type.

Q. Did you continue to use that same design?

A. No; we abandoned that when we started to build the Mark 6 torpedo.

Q. Why did you do that?

A. Well, because we thought we could do better.

Q. That is, you made a better design?

A. Yes.

Q. Whose design was that?

A. That was my design.

Q. I show you a drawing, Exhibit 107, and ask you to refer to the two upper left hand figures and state whether those show the design last referred to.

A. That represents the design that we used with the Mark 7.

Q. Please compare this last design with the design submitted by the Bureau of Ordnance in the blue prints Exhibits 52 and 53?

A. There are two general types of ball bearings; one in which the whole race is filled with balls, and the other in which the race is not filled, but there is a cage or spacer which holds the balls apart; those are two distinct types of ball bearings that are used.

323 This Mark 7 design belongs to one type and the design furnished us by the Bureau of Ordnance belongs to the other type.

By the Court:

Q. They operate in the same way?

A. They operate in the same way.

By Mr. Coles:

Q. And produce the same result?

A. It is the well-known ball bearing that simply runs around in a casing.

By Mr. Fraser:

Q. I understand that there is nothing novel or peculiar about your present type of ball bearing?

A. Nothing at all.

Mr. Youngs: I ask to have that last statement stricken from the record, because it was no answer to the question.

Mr. Coles: The prior art is not applicable to this question.

Q. Before the naval design was submitted to you March 31, 1906, had you used any kind of ball bearings for the Gyro?

Same objection.

A. Oh, yes; we were using a ball bearing.

Q. What kind?

A. They belonged to the full type; that is, the race was filled with balls.

Mr. Youngs: Objected to, and I ask to have the answer stricken out, because there is nothing in this question that has included ball bearings for the torpedo. The question is: Did you use ball bearings?

The Court: The question certainly is very general.

324 Q. Please describe the construction of ball bearings for the gyro of torpedoes which you had used prior to the submission of this naval design in Exhibits 51, 52 and 53?

A. We had used a ball bearing consisting of a race with, I think, 12 balls, as I remember, in the gyros, for the gyro wheel.

By the Court:

Q. Used them when and how?

A. We used them in all the torpedoes that were furnished to the navy; we put these ball bearings in the gyros, and they weren't working as well as we would like to have them; that is, the workmanship

wasn't as good as we could make now, and the consequence was that they didn't work as well.

By Mr. Coles:

Q. Do you mean that you put them in the gyro bearings, or in some other part of the gyro mechanism?

A. I mean I put them in the bearings of the gyro wheel; the bearings on which the wheel revolved.

Mr. Youngs: I ask to have it stricken out unless it is made specific.

The Court: I will strike it out unless it is made specific.

By Mr. Fraser:

Q. You said you used that ball bearing prior to the submission of the naval design. Tell, as nearly as you can, when it was used, and in what torpedo.

A. It was used in the experimental torpedo tested before the Naval Board in 1903; it was then put into the torpedoes made under the first contracts with the Navy Department for Bliss-Leavitt torpedoes.

Adjourned till tomorrow, Nov. 20, 1913 at 2 P. M.

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BROOKLYN, Nov. 20, 1913—2 P. M.

Met pursuant to adjournment as before.

FRANK M. LEAVITT, resumes the stand.

Direct examination by Mr. Fraser (continued):

Q. (Exhibit 107 is handed to the witness.) Prior to the submission to you by the Bureau of Ordnance of the three ball bearings, Exhibits 51, 52 and 53, had there been any other use of ball bearings in gyros than the one particular design which you had used in the torpedoes previously delivered to the Government?

A. Yes, there had.

Q. What were they?

A. The Whitehead Company used a design of their won in the torpedo built by them.

Mr. Bick: We object and ask that the answer be stricken out. On the face of it, it is immaterial.

The Court: It is along the lines that I have been taking all this testimony on.

Complainant excepts.

Q. What type of ball bearing was that used in the Whitehead gyro?

A. That was a ball bearing of the full type, that is, the race was filled full of balls, without the use of a cage or a distance piece.

Q. Which did it most resemble, the one communicated to you by the Bureau or the one in the present type of Mark 7 torpedo?

Objected to as immaterial.

The Court: Let him point out what they were.
Exception.

Q. Can you describe that Whitehead bearing any more fully?

A. It was a bearing in which the balls were contained, in a circular raceway at their outside periphery and bore against the conical end of the spindle on the inside bearing.

Q. Please look at the drawing 107 and state wherein that bearing resembles and where it differs from the bearing shown in that drawing.

Same objection.

The Court: I will take it.

Exception.

A. It varies only in the shape of the outside raceway. In the Whitehead bearing the balls take a bearing at one point on the outside raceway, and in the other it takes a bearing at the two points.

Q. Did the Bliss Company at any time manufacture a Whitehead gyroscope with ball bearings?

Objected to as immaterial.

Objection overruled.

Exception.

A. Yes.

Q. Was that the same construction that you have just described, or a different construction?

A. It was the same construction that I have just described.

Q. When did you manufacture that?

Same objection, ruling and exception.

A. Well, I don't remember the date.

Q. I show you a patent of F. M. Leavitt #814,969, granted March 13, 1906, on an application filed June 17, 1905, and ask you if you are the patentee named in that patent?

A. I am.

The patent is offered in evidence.

327 Objected to as immaterial to the issues in this case.

Objection overruled.

Exception.

It is marked Exhibit 135 (previously marked Exhibit 109).

Q. Please look at the ball bearings shown in this patent and state whether the Bliss Company ever manufactured any torpedo gyros containing that construction of ball bearing?

A. It did.

Mr. Bick: I ask that it be made more definite just when this construction was made.

By the Court:

Q. Is it the construction claimed in the patent?

A. It is shown in the patent, but I don't think it is claimed there.

Q. Point it out where the disclosure is, in the drawings and specifications or what, where it is.

A. In the drawings; I will have to look through to see whether it is in the description; it is also disclosed in the description.

Q. Well, where? What drawings and what line?

A. It is disclosed in the drawings in Figure 2, and in the description in lines 70 to 75 of the specifications, page 1.

By Mr. Fraser:

Q. What type or Mark of torpedo was that construction introduced into?

A. That was in the Mark 4, we called it.

Q. Was it made before or after the communication by the Bureau of Ordnance of the 3 ball bearings?

A. I don't remember the date exactly of that communication.

Mr. Bick: March 31, 1906.

328 A. (Continued) Then it was before.

Q. On the subject of ball bearings generally, how long have you known of the use of ball bearings?

Mr. Bick: Objected to as immaterial, and I ask to enter an objection to all this line of testimony.

The Court: I don't think we will go into that.

Mr. Fraser: I want to show that the ball bearings have been known by mechanics and engineers for a great many years as being a very obvious thing. This witness is probably as competent as any man we could produce to testify to that fact.

The Court: I am not going into the ball bearings generally. We have got specific constructions in evidence now, and that is as far as it is necessary to go. The ball bearings as applied to the gyroscope are what we are talking about, not as applied to bicycles.

Exception.

Q. I show you a little device and ask what it is.

A. That is one of our present types of ball bearings for gyros.

Q. Is that used in the Mark 7?

A. Yes.

Q. What is the separate little piece at the side?

A. That is the center which goes into the spindle of the wheel which runs in the ball bearings.

The little device is offered in evidence.

It is marked Exhibit 136.

It is produced to the court.

Q. What do you know about the compound regulation of air or the use of two successive pressure reducers which the Bureau of
329 Ordnance claims to have communicated to the Bliss Company?

A. That is a common device for reducing high pressures to lower pressures.

Q. Did you see the letter communicating that double regulating scheme, being Exhibit 65, a Bureau of Ordnance a letter of January 18, 1913?

A. I did.

Q. At or about that time or shortly prior to that time, had you had any talks with any of the officers of the Bureau on that subject?

A. Yes, I had had talks with several of the officers.

Q. Did the Bureau submit any design of that device?

A. It did not.

Q. Did you say anything to any of the Bureau officers on the subject of their submitting a design?

A. Yes, I asked them for a design.

The Court: Asked who?

Q. Whom did you ask?

A. I asked, I think, Mr. Sawyer; I know I asked Captain Williams.

By the Court:

Q. Do you refer to Commander Williams?

A. I refer to Commander Williams.

By Mr. Fraser:

Q. Who testified as a witness?

A. Yes.

Q. What did these gentlemen say to you about furnishing a design?

Mr. Bick: Objected to unless the time is made more definite.

By the Court:

Q. Yes. Where did you have this conversation with Commander Williams?

A. I think I had a conversation once at Sag Harbor.

Q. When?

A. I can't locate the date.

330 The Court: I cannot take any conversations at large.

By Mr. Fraser:

Q. Was that before or after the date of that letter?

A. I can't remember that.

Q. Can you tell about how long it was before or after the date of that letter?

Mr. Bick: Objected to as already answered.

The Court: If he doesn't know whether it was before at all, how can he say?

A. I can not.

The Court: It is perfectly obvious that he couldn't if he couldn't tell it was before.

Q. I will ask you to state the conversation as you remember it.

Mr Bick: Objected to.

Objection sustained.

Exception.

Mr. Bick: I ask that all testimony as to these conversations with naval officers be stricken out.

Motion granted.

Defendant excepts.

Q. Irrespective of the date, at any time when the subject came up between you and these naval officers about putting in a double regulator, what was said, as you remember?

Mr. Bick: Objected to.

Objection sustained.

Exception.

Q. At the time when any officers of the Bureau of Ordnance were talking with you about the desirability of introducing into
331 the present type of Bliss-Leavitt torpedo what they call a compound regulation of air—that is, the use of two successive pressure reducers—what was said between you and such officers, as you remember?

Mr. Bick: Objected to on the ground that it is leading in the first instance, and indefinite.

The Court: What officer is he going to talk about?

Mr. Fraser: Well, I will narrow the question to Commander Williams.

The Court: Can you answer that?

Mr. Bick: Objected to on the ground that is is vague and indefinite, and uncertain.

The Court: He may answer.

Exception.

A. Commander Williams told me that he thought the double regulator would be a very good thing to introduce, or words to that effect, and I asked him if he had any design to give us. That is the upshot of it.

Q. What did he reply?

A. I don't remember any reply.

Q. How about Mr. Sawyer, as to your conversation with him?

A. I had so many conversations with Mr. Sawyer on these subjects, that I can't locate any definite one.

Mr. Bick: Objected to. Of course there is no evidence that he ever had any conversation with Mr. Sawyer on the subject. I object also as leading.

The Court: The witness says frankly that he can't remember.

Q. As an expert in torpedoes, will you tell the court whether under the conditions existing at the time when this suggestion
332 was made, there was any difficulty in changing from one to two valves, and give your reasons?

Objected to as leading, and vague, and calling for a conclusion.

The Court: Objection sustained on the ground that it is immaterial.

Exception.

Q. In your opinion as a torpedo expert, was it desirable or otherwise to introduce a second pressure-reducing valve?

Same objection.

Objection sustained.

Exception.

Q. Who designed the arrangement of two valves that was afterwards introduced into the Mark 7 torpedo, now under manufacture?

A. Mr. Dieter.

Q. Did you have anything to do with it?

A. Very little.

Mr. Bick: On this point I desire to ask if we understand by the term "design" a drawing; it is used frequently here as a design, and it may be one of the points for the court to determine just what a design is.

The Court: You mean the drawing, the working drawing, by a design?

Mr. Fraser: I mean the drawing.

Mr. Coles: The Government's contention is that under the language of the contract, a design may be disclosed to those skilled in the art verbally, without the necessity of its being necessarily a drawing.

333 By the Court:

Q. Does your answer mean practically nothing?

A. I advised a little on the details.

By Mr. Fraser:

Q. Why was it necessary for you and Mr. Dieter to advise together on that?

Objected to as calling for a conclusion.

Objection sustained.

Exception.

Q. What would have been the effect if you had simply taken two of the existing valves and attempted to put them into the torpedo as it then existed?

Objected to as immaterial.

Objection sustained.

Exception.

Q. The torpedo here in evidence, Exhibit 27, has only a single pressure-reducing valve. Will you please explain how the two valves or double reducing valve was applied to the torpedo?

Objected to as to form and as leading.

The Court: I don't think it does any harm in this case. I will hear the answer.

Exception.

A. It was applied by altering the design and making room to get it in; that is, we had to do considerable scheming in order to get the

valve into the space it was to occupy. The space was very contracted, and the problem was to make two valves similar to the one valve and get them in the space at our disposal without getting too much weight.

Q. Will you please step to the exhibit and explain the existing construction and the altered construction, to the court?

Mr. Bick: Objected to on the ground that the exhibit in evidence was made prior to this notification in 1913 and is not that which they intended to disclose. This was January 18, 1913, and the exhibit was manufactured prior to that time, and it has been already explained that that is the reason that the double air regulator is not in that exhibit.

The Court: If you can do it very briefly, I will take it.
Exception.

A. The space that the regulator—this is the regulator (indicating); the space that it occupies almost fills up that little pocket (indicating). What we had to do was to change the design to get two of those in that space; and that had to be worked around until we could manage to get that into that space.

Q. Now, with reference to this question of the single or double pressure reducer: I show you two colored drawings and ask you if you identify them and what they are.

A. One is the drawing of the single reducer device, and the other is the drawing of the double reducer device.

Q. State whether the drawing of the single reducer device agrees with or illustrates the construction of the regulating device as provided in this exhibit 27.

Mr. Bick: Objected to as immaterial.

The Court: I will take it.

Complainant excepts.

A. It does.

Mr. Fraser: I offer in evidence as Exhibit 137 this drawing.

335 Same objection, ruling and exception.

It is marked Exhibit 137.

Q. Now the other drawing, what does that show?

A. That shows the double regulator device as we finally built it for the later torpedoes.

It is offered in evidence.

Same objection, ruling and exception.

It is marked Exhibit 138.

Q. With reference to the last drawing, did the Bliss Company receive any assistance from any of the naval officers connected with the Bureau of Ordnance in overcoming the difficulties involved in the introduction of the two pressure-reducing valves?

Mr. Bick: Objected to as calling for a conclusion and as leading, and I object also to the form of the question as indefinite, and

further on the ground that the difficulties of construction had nothing to do with the question of whether a design was submitted.

The Court: I will take it.

Exception.

A. It did not.

Mr. Fraser: In closing our examination of this witness, we do so on the understanding that it is by the court's direction that we withhold any testimony at present concerning those other six items. Is that correct?

The Court: Yes.

Cross-examination by counsel for the complainant.

By Mr. Bick:

Q. The Bliss Company was paid by the Government, was
336 it not, for these changes made in the air regulator?

A. I don't think so.

Q. You don't say that they were not, do you?

A. I am quite sure they were not.

Q. Hasn't there been a meeting of the Board for the purpose of adjusting the compensation to which the Bliss Company should be entitled for making this change?

A. I believe there has been a Board appointed.

Q. Then the Bliss Company expects to be compensated for making this change, do they not?

A. They hope to.

Q. The torpedo which was made as a result of the drawings of 1898 was the one that was referred to by Mr. Longacre as the one that wrecked itself; is that not so?

A. Yes, that is so.

Q. And that was the only torpedo of that construction that was ever built?

A. That is the only one.

Q. Referring to the report of the Torpedo Board, Exhibit 133, which was read to you by the defendant's counsel, Mr. Fraser, the torpedo reported on by the Board in that report was the first type of what is known as Bliss-Leavitt torpedo, with the unbalanced turbine in it, is it not?

A. That is right.

Q. And the unbalanced turbine which was in that torpedo was similar to the unbalanced turbine manufactured by the Bliss Company for the United States Government?

A. Very similar.

Q. And this turbine was not of the type described by Mr. Longacre?

A. Not in regard to the direction of the wheels?

Q. In other words, it was not of the same unbalanced type?

A. It was not.

Q. The torpedo referred to in that report also had installed in it

337 an air spun gyro of a modified Kasalowsky type with air impinging on buckets cut on the rim of the gyro wheel itself, did it not?

A. It did.

Q. And the gyro also had an electrical element embodied in it, did it not?

A. It did at that time, yes.

Q. It also had a mechanical steering engine embodied in it, did it not?

A. It had a mechanical steering engine for the horizontal direction, but not for the depth.

Q. It also had an exhaust through the center of the hollow shafting of an enlarged area as suggested to the Bliss Company by the Bureau of Ordnance, did it not?

Objected to.

A. No, not as suggested by the Bureau of Ordnance.

Q. But it did have that hollow shafting and the exhaust?

A. Yes, it did.

Q. And did it not also have a diaphragm starting gear operated by the pressure of ejection in the torpedo tube?

A. It did.

Q. Will you tell me what of the above enumerated features, if any, are embodied in the existing type of torpedo, being Exhibit 27 in evidence?

A. The air spun gyro, the air depth engine—Well, there are many changes in design; there is very little resemblance in this torpedo to the other.

Q. Is the air spun gyro that you just mentioned in any way similar to the one that is embodied in the exhibit?

A. No, it is very different.

Q. Then there is practically nothing that is similar?

A. It is different in design altogether.

Q. Why were these features of the old torpedo discarded?

A. Because, in my judgment, I could improve on them.

338 Q. Was that the only reason?

A. That is the sole reason.

Q. Referring now to the 50 18-inch Mark 3 torpedo, to which you testified that the Bliss Company had completed for the United States Government, did these torpedoes function properly on the range for acceptance?

A. They—

Q. Yes or no, if you can.

A. I say they functioned within the requirements of the specification.

Q. As to range?

A. As to range and speed; everything.

Q. Did they embody the features that you have just testified as to having been discarded, or any of the features?

Mr. Fraser: Objected to; he didn't say they were discarded; he said they had been improved upon.

Q. Well, I will take his language: which you have testified could be improved upon.

A. Certainly; we were improving the torpedo from that day to this.

Q. Did these fifty 18-inch Mark 3 torpedoes embody any of the features which you say have been discontinued?

A. They embodied nearly all the features in a modified form; that is, I improved upon them.

Q. Were all the features modified?

A. Well, not all the features of the torpedo; no.

Q. Those that we have referred to here a few moments ago?

A. Of course I have got to stop and look at them; quite a number of changes were made, and it is years ago.

Q. I want to know whether these fifty 18-inch torpedoes Mark 3 contain any of the features which were contained in that torpedo to which the report referred and which we have specified here on the previous part of the examination?

339 A. They were all contained in it, as I say, in a modified form. That is, I improved on them.

Q. They were all improved?

A. Practically all improved.

Q. What was the type of super-heater installed in that torpedo, the last one referred to?

A. That was the superheater known as the inside super-heater, the original form.

Q. Did you have any accidents with these torpedoes during their trial runs?

A. Oh, I expect we had plenty of them.

Q. Well, of course, other than those which were usually encountered in the operating of a torpedo?

A. Nothing was usual at that time.

Q. Do you say nothing was usual?

A. The whole thing was new.

Q. But would you not, often have accidents of small, minor, immaterial matters?

A. Undoubtedly.

Q. Were there any accidents other than these of a minor nature?

A. There might have been; I don't remember the details.

Q. You are not positive as to that. Do you know whether these 50 18-inch Mark 3 torpedoes we have just referred to have ever been used in the naval service?

A. I don't know of my own knowledge anything about it.

Q. Do you know what is being done with those 50 torpedoes by the Government at the present time?

A. I do not.

Q. Do you know whether or not the Government is rebuilding these 50 18-inch Mark 3 torpedoes?

A. I don't know anything about it.

Q. You don't know that to be a fact?

A. No.

Q. Referring to the contract of November 22, 1905, being Exhibit 1, what type of turbine was installed in the first 50 torpedoes delivered under that contract?

A. Which torpedoes were those?

340 Q. 21-inch?

A. Practically the same type as was installed in the 18-inch.

Q. And what is that commonly known as? What type?

A. The mark 3 do you mean?

Q. No; what type of turbine?

A. The type of turbine was the Curtis.

Q. It was what we call the unbalanced turbine?

A. That is your term for it, yes; that is what you call the unbalanced turbine; that is right.

Q. What type was installed in the remaining 250 of that contract?

A. In the remaining 250 we installed the turbine which has been testified about here; I don't remember how it was specified.

Q. That is the balanced turbine?

A. Yes, the turbine that was built in 1906.

Q. Why did you change the type of turbine engine?

A. Well, I didn't do it.

Q. Wasn't it done under your supervision?

A. No, it was Mr. Page who did that; he is responsible.

Q. You didn't believe in the balanced turbine, did you, at that time?

A. No, I didn't take any stock in it.

Q. So you left that entirely to Mr. Page to attend to?

A. I didn't leave it to him, no; there was a great deal of discussion going on in regard to this question of balancing the turbine, and while I was at Sag Harbor struggling with the torpedoes he took the thing into his own hands and they were built.

Q. You are still prejudiced against the balanced turbine?

A. No.

Q. You don't believe in its efficiency?

A. I do believe in its efficiency; there is no difference in the efficiency.

Q. Mr. Page had them built in quite a hurry, did he not?

A. He did.

Q. Was that during November, 1906?

341 A. It was sometime through the latter part of the year; I couldn't locate the exact date.

Q. What type of super-heater was installed in the torpedoes of this contract?

A. The Armstrong.

Q. Will you please explain just what the Armstrong type was?

A. The Armstrong type was a type in which, instead of heating the air inside the flask, it was passed through what we call a heating pot, and heated in that in place of in the flask.

Q. They were installed in the first 50, were they not?

A. I can't remember just when we began installing those.

Q. Do you know whether they were contained in the 250?

A. I think they were.

Q. You are not positive as to that, are you?

A. Well, I couldn't state definitely just the number that we installed them in; I don't remember.

Q. Referring to this contract for 300, of November 22, 1905, what was the prospect of delivery in accordance with the terms of the specifications as originally attached to the contract in 1906?

A. We couldn't obtain the speed that was required by the specifications; the range, I meant to say. We couldn't obtain the range that was called for by the specifications.

Q. Then the prospects were very poor of complying with the terms of the specifications in regard to delivery, were they not?

A. They were very poor, yes, in that respect.

Q. About that time the Bliss Company were communicating with the Bureau of Ordnance, were they not, requesting a reduction in the requirement of the specifications as to range, stating that the company had exhausted every means in an effort to cause these torpedoes to meet the range requirements, without success, and
342 requesting that the range be reduced, and the torpedoes be accepted under reduced requirements?

A. That is correct.

Mr. Bick: At this time I offer in evidence from Folio E, letter at page 8, of May 16, 1907, and I will read particularly from the exhibit.

The Exhibit is marked 69.

The letter is produced to the court.

The Court: You need not read it. I will look it over.

Mr. Bick: I now offer in evidence from the same, page 10, being a letter from the Bureau of Ordnance to the Bliss Company, dated May 25, 1907. I direct the court's attention particularly to the third complete paragraph on page 12.

The letter is marked Exhibit 70.

Mr. Bick: I offer in evidence from the same folio, letter on pages 11, 12 and 13, from the Bliss Company to the Bureau of Ordnance, dated June 25, 1907, and I call the court's attention to the third completed paragraph on page 12.

The letter is marked Exhibit 71.

Mr. Bick: I also offer in evidence letter on page 13, commencing at the bottom thereof, being letter of July 8, 1907, from the Bureau of Ordnance to the Bliss Company; and I call the court's attention particularly to paragraphs 9, 10, 11 and 12 of that letter.

Mr. Fraser: If the court please, we object to this letter on the same grounds that we might have objected to the three preceding letters, as immaterial.

343 The Court: Did you answer that letter?

Mr. Youngs: May I request the court to get an answer from the interrogatory which the court itself made: "Did you ever answer that letter" and that has not been replied to.

Mr. Platt: We will look it up and see. There is nothing, so far as I can see in this folio, that would indicate that we did; but I wouldn't say that for sure, because I haven't read it with care.

The Court: Well, let it stand just where it is till it is looked up, and then you can make any motion that you please. I will mark it, subject to your investigation, and you can move to strike it out. As a part of the general situation, I suppose I cannot say that it is inadmissible.

* * * * *

The Court: Let these letters stand here and I will read the four letters carefully myself.

Mr. Bick: To complete it, I offer in evidence pages 18 and 19 of folio E, to complete the situation.

The letter on page 18, being dated October 24, 1907, from the Bureau to the Bliss Company, is marked Exhibit 73.

The reply of the Bliss Company to the Bureau, dated October 30, 1907, on page 19, is marked Exhibit 74.

Mr. Bick: In reading these communications I will ask the court to examine Exhibit No. 31, being in Folio B, page 93.

Mr. Platt: We object to them as immaterial, irrelevant and incompetent.

The Court: I will examine them.

344 Mr. Platt: We move on the same grounds to strike out Complainant's Exhibits 69 to 74 inclusive. I make that motion because I assume, if the court please, that if I make it in that way when it comes up on the briefs, if it is on the record, it can be considered by the court all at once.

By Mr. Bick:

Q. Were any of these torpedoes accepted and under what conditions? (Referring now to those manufactured under the contract of 1905.)

A. The last 250?

Q. Yes.

A. The Bureau of Ordnance changed the specifications and penalized the company, I think, about \$600 a torpedo; reduced the speed from 3500 yards to 3,000 yards and made us pay for it.

Q. How many were accepted under those conditions?

A. Well, I don't remember the number that were accepted under those conditions; I can't tell.

Q. Do you remember whether there were 40 or 50 of them?

A. There was quite a number of them.

Q. No more than that?

A. Oh, there may have been more; I don't remember.

Q. Less?

A. I say I don't remember.

Q. In 1907, after the installation of the balanced turbine, and thereafter until the completion of the contract, did the remaining 250 torpedoes meet the requirements as originally set forth in the contract as regards range and speed?

A. Well, I don't remember the details of those constructions; I know that later we put the Armstrong heater in, and we got much more range; we got 4,000 yards. Just which torpedoes, I can't tell you.

Q. Well, we will take up that later. What type of turbine
345 was installed in the 1909 contract torpedoes?

A. Which contract is that?

Q. The contract of 1909.

A. I know the date, but I don't remember all these contracts by dates. Let me know what the contract is.

Q. The mark 3, 21-inch.

A. That was practically the same type of engine; you say the engine?

Q. The turbine.

A. That was the same type of turbine as we had been putting in the other torpedoes.

Q. That is, in the first 50 of the 1905 contract?

A. No, the ones with the reversed wheels.

Q. What we call the balanced turbine?

A. Well, call them the balanced turbine.

Q. In regard to torpedoes manufactured under the 1909 contract, were there any difficulties encountered in the torpedoes in the specifications as to range and speed?

A. Not that I recall.

Q. And they were a distinct improvement over the torpedoes delivered under the contract of 1905, were they not?

A. There wasn't very much improvement in those torpedoes.

Q. There was some improvement, was there not?

A. Not outside of putting the Armstrong heater into them; not that I can remember.

Q. Do you know when these torpedoes of the 1905 contract were finally delivered?

A. No, I don't remember that.

Q. Do you know whether it was during 1908?

A. I don't remember.

Q. 1909?

A. I don't remember.

Q. Do you know whether extensions of time were granted to the Bliss Company to fulfill this 1905 contract, for the reasons set forth by the Bliss Company?

A. Yes, under the contract we called for extensions.

Q. Was that extension called for in the letter of July 12, 1910, being at Folio E, page 21?

346 Mr. Fraser: Objected to as immaterial; the whole subject of extension of time has no materiality to this issue.

The Court: He may answer.

Exception.

A. I can't say as to that particular letter; there were a number of letters on that subject. I couldn't say anything about that.

The letter is offered in evidence.

Objected to as immaterial.

Objection overruled.

Exception.

It is marked Exhibit 75.

Q. Is it not a fact that during all this time liquidated damages or penalties, were accruing in accordance with the terms of the contract.

Mr. Fraser: Objected to as calling for an interpretation of the contract, and the contract speaks for itself; this is utterly immaterial to this case anyway.

The Court: I don't think that I will let the witness testify in answer to that question.

Complainant excepts.

Q. I will ask this: were any penalties or liquidated damages assessed or waived by the Government, which might have been collected under the contract?

Same objection.

The Court: I don't think you have got it right yet.

Q. Were any penalties or liquidated damages assessed by the Government for work which was being done under the contracts in evidence in this case?

Same objection.

347 The Court: What has that got to do with this case? If there are any statements or admissions of specific reasons that bear on the issues in this case, that is one matter; but these generalities are too remote.

Complainant excepts.

Q. Do you know what the approximate amount involved in these contracts was?

A. No, I couldn't tell you that off-hand; I should have to figure it up; I couldn't answer that possibly.

Mr. Fraser: The contracts speak for themselves.

Q. Referring to Exhibit 58, being in Folio A, page 82, and the blue print which follows, page 88, does not that represent the so-called outside water super-heater?

A. It represents a heater, yes.

Q. What is known as an outside water superheater?

A. Well, that term is simply a local term that has come up; we have always called the outside super-heater the one we build, as compared with the inside super-heater which we formerly built; that is not a generic term applying to outside things; it is simply a term that has come up by use.

Q. That is what has been referred to in this case as an outside super-heater?

A. This is not the thing at all, no, that has been referred to in this case as an outside super-heater; that has always been the Armstrong super-heater.

Q. That is not the Armstrong super-heater?

A. No, it is not.

Q. But is not that an outside super-heater?

A. It is a drawing that might be that, or it might not; I don't know anything about it except what I see on this piece of paper.

348 Q. You don't recall having seen that before, do you?

A. I have a faint memory of seeing it; not very vivid.

Q. Do you say that, from reading that blue print, you cannot tell whether that represents an outside super-heater?

A. It represents something that would possibly—if it is operative it might heat the air for the torpedo.

Q. That is the best answer you can give on that?

A. That is the only answer I will give on that; I don't know anything about the working of it; I never examined it in detail, as to how it worked.

Q. The existing type of torpedo contains what I have been referring to as an outside water super-heater, does it not?

A. It does.

Q. You spoke of making some experiments with the unbalanced type of turbines about six or eight months ago. Will you kindly give us some definite date as to when those experiments were made?

A. Six or eight months ago, as near as I can locate the date.

Q. Do you say that it was within this year?

A. I say six or eight months ago, as nearly as I can locate the date.

Q. Can you tell whether it was before or after May 9th, 1913?

A. I will say nothing more than I have said.

Q. Will you say whether it was in June of this year?

A. I say it was probably six or eight months ago; that is as close as I can tell you.

Q. It might have been ten months ago?

A. I have told you all I know on the subject.

Q. And you can't make any other definite date than that?

A. I will make no other statement than that.

Q. Do you know where the experiments were made?

A. I do.

Q. Where?

A. At the works of the E. W. Bliss Company.

349 Q. You don't recall, do you, whether these experiments were made about the time of the visit of the English and Austrian naval officers to the works of the Bliss Company in December, 1912?

A. I don't see any connection, no. I don't recall that at all.

Q. That doesn't refresh your memory as to when the tests were made?

A. Not at all.

Q. But they were made after that at any rate, you would say?

A. I don't remember what visit you are speaking of.

Q. Don't you recall that in December, 1912, some English and Austrian officers intended to visit the Bliss Company and did visit it and objection was made by the Bureau of Ordnance?

A. Oh, you mean that Whitehead people; oh, yes, I remember.

Q. Was it after that visit? A. I think it was after that; that was a year ago.

Q. There is no question about that?

A. I think it was after that; that was a year ago.

The Court: You had better take Mr. Leavitt off the stand and put Mr. Curtis on.

Witness withdrawn for the present.

350 CHARLES G. CURTIS, recalled, by the defendant.

By Mr. Fraser:

Q. I think you testified the other day that you had some conversation with Mr. Leavitt concerning the application of the Curtis turbine to a torpedo. Will you now tell what he disclosed to you during those conversations as to what he proposed to apply in the torpedo? What construction he proposed to introduce?

Mr. Coles: Objected to as indefinite and immaterial.

The Court: Direct this witness' attention specifically to what you got from Mr. Leavitt.

By the Court:

Q. You had some talk with Mr. Leavitt, did you, on that subject?

A. Yes, sir.

Q. When was it?

A. It was in 1897 or '98.

Q. What was the occasion of that talk? Did he come to see you, or what?

A. Yes, he came to see me at first, and he was discussing applying the turbine to the torpedo; a number of mechanical propositions arose and I used to meet Mr. Leavitt sometimes in Brooklyn and sometimes in the Lawyers' Club in New York. At one of these talks Mr. Leavitt proposed to construct the turbine in such a way that one of the wheels would turn in the opposite direction to the other. He told me that he had in view the elimination of any possible gyroscopic action. He didn't feel at all sure that there was any gyroscopic action of sufficient magnitude to cut any figure, but he wanted to see whether there was or not, and he wanted to overcome it if there was. He asked me whether there was any difficulty in building the turbine that way, and whether it would
351 operate efficiently. I told him that there was no difficulty whatever; that the idea of a turbine with one wheel turning in one direction and the other wheel turning in the opposite direction was very old in the art; it probably dated back 20 years or 30 years before that time. Of course Mr. Leavitt knew that by building the thing in that way the gyroscopic action would be completely overcome; but he expressly told me that that was his object. He asked particularly about efficiency, and I told him——

Q. If he knew, why did he inquire?

A. He asked me whether I knew any objection; that is to say, he asked whether I knew any mechanical objection, or any objection regarding the efficiency of the turbine. I told him that there

was none; that the turbine would give a little higher efficiency if you got what has been called, as I understand it, the balanced turbine, and there was no objection to doing it.

Mr. Coles: I move to strike out the part of the answer in which the witness says "of course Mr. Leavitt knew" as a conclusion.

The Court: Yes.

Mr. Coles: I move to strike out the whole testimony as irrelevant and immaterial.

The Court: Well, go on.

By Mr. Fraser:

Q. What do you base your statement on that Mr. Leavitt knew that?

Objected to as immaterial and leading.

The Court: What did he say?

A. He knew it because all mechanical engineers know that.

Mr. Coles: I move to strike out the answer.

352 The Court: Strike it out.

Exception.

Q. Did Mr. Leavitt show you in any way how he proposed to apply these oppositely revolving turbines in the torpedo?

A. He did.

Same objection and motion to strike out.

The Court: Have you got the drawing here?

The Witness: He made a pencil sketch showing not only the turbine wheels turning in the opposite directions but the details of the gearing as he proposed to apply it.

Q. Can you from memory describe what he showed in that sketch?

A. No.

Q. Was the sketch preserved?

A. No.

Q. As far as you know, it is not in existence today?

A. No.

Q. Will you please describe the construction that was shown in that sketch?

Mr. Coles: Objected to because it is a well known proposition of patent law and any other kind of law for that matter, that when you are dealing with the question of a disclosure, the testimony must be more definite in its nature than that asked of the witness by this question.

The Court: He hasn't told what it is yet. Go on.

Complainant excepts.

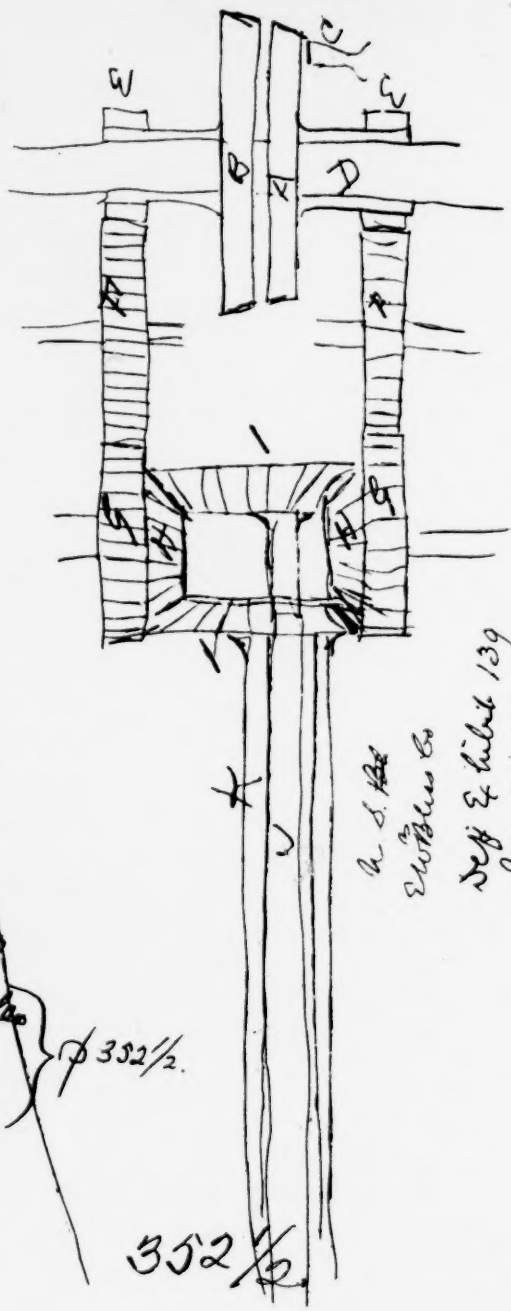
A. I can best describe it by making a pencil sketch of it, if you like.

Q. Very well. Will you please make a pencil sketch of it?

Witness does as requested.

(Here follows diagram marked page 352½.)

Defendant's Exhibit 139.



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 Bliss Co.
 v
 W.S. } $\phi 352 \frac{1}{2}$

$352 \frac{1}{2}$

R. S. ~~Bliss~~
 Electro-Mech Co.
 Def & Exhibit 139
 Nov. 20, 1918
 The Court
 Clerk



353 Q. Having made a sketch, will you please describe that sketch and put letters on to indicate the parts as you refer to them?

A. These are the two turbine wheels, A-B, turning in opposite directions. C is the nozzle. Those two wheels are attached to sleeves; these projecting portions here which revolve on this pin D; each of these sleeves carries a pinion here, at E-E. Those two pinions engage independently through these intermediate gear wheels here F-F. Those gear wheels engage with other gear wheels over here, G-G, which are on independent shafts, and these gear wheels carry bevel pinions H-H, which engage with other bevel pinions I-I. This bevel pinion is mounted on the end of this interior shaft and this bevel pinion is mounted on the exterior shaft. J is the interior shaft and K is the exterior shaft. The operation of the device is simply this: this wheel A operates through pinion E, gear F, gear G, and bevel gear H, to drive the bevel gear I and thereby turn the shaft J. The other wheel B operates through a similar set of gears to drive the exterior shaft K. The air jet from the nozzle passes first through the wheel A, causing it to turn in one direction, and then through the wheel B, causing it to turn in the opposite direction.

Mr. Fraser: I offer in evidence the sketch, as Exhibit 139.

Mr. Coles: We object to the introduction of the sketch as being incompetent evidence relating to any of the issues in this case.

Objection overruled.

Exception.

It is marked Exhibit 139.

354 Q. I show you Defendant's Exhibit 129, and ask if you identify it, and if so, what it is and whether it will assist your memory in fixing the date of your talks with Mr. Leavitt on this subject.

A. This is one of the original copies of an agreement between the Curtis Turbine Company and the E. W. Bliss Company, which was executed by myself, and is dated June 23, 1898. I am confident that my conversations with Mr. Leavitt regarding the unbalanced turbine were before the date of this contract.

The Court: That was the upshot of your conversations?

The Witness: Yes.

Q. I show you now a letter and ask you if you identify that, and if so, whether that will aid you in getting any nearer the date?

Same objection, ruling and exception.

A. This letter is a letter dated December 8, 1897—

The Court: That isn't the question; the question is if you identify it and if it will get you any nearer the date.

A. I don't know that I can answer the question without stating what the letter is.

The Court: You can answer whether it does assist you or not.

By the Court:

Q. Does it assist you in identifying the date of the conversation? When you read the letter you will know whether it does or does not.

A. That letter simply carries the date of the contract back.

By Mr. Fraser:

Q. State whether or not the letter assists you in fixing the date of those conversations.

A. It assists me in fixing the date back some considerable time before June, 1898.

355 Q. Were the conversation before or after the date of that letter?

A. I feel quite sure they were before the date of the letter, but I do not know that I could so swear positively.

Q. The letter purports to have been written by Mr. Leavitt to you. Do you remember receiving that letter?

A. I think I do.

The Court: If you don't remember, say so. Your testimony so far as it is competent must be positive.

A. I can't positively remember receiving a letter like that; I am not clear about it.

Q. From whose custody did this letter come? Who has had the letter all this time?

A. It has been in the custody of my company; virtually in my custody.

Q. What is the date of that letter?

A. December 8th, 1897.

Q. Did Mr. Leavitt procure from you any design or details concerning the buckets or blades of the Curtis turbine?

A. He did.

Q. Were those designs or details for turbine wheels revolving in the same direction or in contrary directions?

A. I remember distinctly that the designs were for turbines turning in opposite directions at that time.

Q. Can you fix, in any way, the date when you gave him those details or designs for oppositely revolving turbine buckets?

A. Well, it was before December, 1897.

Q. I would like to have you explain if you please the mode of operation of what is known as the Curtis turbine; I mean with respect to the action of a jet of air or other fluid; its action upon the wheel or wheels, and any reaction that takes place.

Mr. Coles: Objected to as immaterial to any of the issues here.

356 The Court: What is the bearing of this?

Mr. Fraser: We want to show wherein the reaction is that the other side has contended occasions the initial roll of the torpedo; we want to show the court where the seat of that reaction is. Nobody in the world probably understands that fact better than the eminent engineer who is now on the stand. I may say that the wit-



ness in court made some sketches illustrating what we want to prove, and I should like to ask him to identify these sketches and explain them.

Mr. Coles: I insist upon my objection.

The Court: I will take it.

Complainant excepts.

By the Court:

Q. Have you just made those sketches?

A. Yes, sir.

The first sketch referred to by the witness is marked Exhibit 140 for Identification.

A. (Referring to Exhibit 140 for Identification). The shaded portion represents the nozzle N; this represents the first wheel turning in one direction (B-B); this one represents the second wheel turning in the opposite direction, which we will also mark B-B. This portion of the nozzle is what we call the bowl or chamber, which I will mark C. Let us assume that in this chamber we have air at 400 pounds pressure. The part marked D is a restricted opening which is very small in area compared with the size of the bowl C. The difference in the pressure which exists between the point D and the point C causes the air to flow rapidly in the direction of D. In practical working, the pressure being 400 pounds in the bowl,

(Here follows Diagram Marked p. 356½.)

357 declines to a pressure something like 200 pounds at the point D, which we call the throat. Beyond this point D the nozzle enlarges—that is, the walls diverge. The air in passing through the diverging portion of the nozzle continues to decline in pressure, and if that divergence is enough—that is, if the enlargement between the point D and the end of the nozzle is enough—the pressure at the nozzle end may be brought down to zero. In practice, in the case of the torpedo, it is brought down to about 20 pounds. In the process of giving up its pressure, so to speak, the air flowing in this direction through a continually declining pressure, a very high velocity is developed. At the point E or at the nozzle N, the velocity may be as high as 3,000 feet a second, or greater than that of a rifle bullet—

Q. How about the pressure at that point?

A. The pressure at that point is down to 20 pounds or whatever pressure exists in the chamber in which the wheels revolve. The air at this very high velocity is projected by the nozzle through the first wheel and impinges against the buckets as its direction is changed. It issues from the first wheel at a considerably reduced velocity and passes into and through the second wheel, which reduces its velocity still further. So that by the time it issues from the second wheel, it will have lost a large portion, or practically all of its velocity. This is the simplest form of turbine with the wheels turning in opposite directions.

Mr. Fraser: We offer the sketch in evidence.

Objected to as incompetent, irrelevant and immaterial.

It is received and marked Exhibit 140.

Complainant excepts.

358 Cross-examination by Counsel for Complainant.

By Mr. Coles:

Q. When were you first asked about testifying in this case and by whom?

A. About a week ago, by Mr. Leavitt.

Q. What efforts were made at that time by Mr. Leavitt to refresh your memory about this alleged visit of his to you in 1897 or 1898?

A. Mr. Leavitt asked me whether I recalled having discussed with him the balanced turbine as far back as 1898 or thereabouts.

Q. Did he, on this last occasion, show you any sketches or drawings to indicate the device which he wishes you to recall as having been discussed by you in 1897?

A. He showed me a colored drawing which you have here in evidence, in the court room.

Q. How do you know we have it in evidence?

A. I believe it is in evidence; I am not sure; I can identify it. I had not seen it until I saw it here in the court room the other day.

Q. Was it either one of these, which are exhibits 126 and 127, which you say Mr. Lavitt showed you the other day?

A. Yes, these are the ones.

Q. Isn't it a fact that this sketch which you have made on the

stand here today was produced by you from your recollection of the device disclosed in Exhibits 126 and 127?

A. The device I sketched today was in my mind before I saw those pictures.

Q. How many times since 1897 have you tried to sketch a device of the same character as the sketch which you made on the stand here today, Exhibit 139?

A. During the last 14 or 15 years I have frequently discussed different forms of turbines and different forms of gearing and
359 driving mechanism with Mr. Leavitt. I believe that answers the question.

Q. That doesn't answer my question. I wanted to know whether you could swear that at any time since you say this conversation took place in 1897 or 1898 you have attempted to embody in a sketch what you say now Mr. Leavitt disclosed to you then? In other words, isn't this sketch which you made on the stand today the first time you have tried to embody that alleged disclosure, and isn't it the result of your examination of Exhibits 126 and 127, about a week ago?

A. I am quite clear that I have on a number of occasions during the last 12 or 14 years disclosed exactly that same type of turbine and the same arrangements of gearing with Mr. Leavitt.

Q. You still seem to misunderstand the question. I didn't ask you how many times you had discussed it with anybody. I asked you if you had attempted to embody in a sketch any design which you now say Mr. Leavitt disclosed to you in 1897 or 1898, until today?

A. I have on a number of occasions made a sketch of just that form of turbine, with various forms of gearing including the exact form there shown, during a period of the last 14 years.

Q. My point is this: you have said you did not know that your testimony was desired in this case until about a week ago. Therefore you didn't know until then that the defendant would want you to say what Mr. Leavitt had disclosed to you, if anything, in 1897 and 1898. Therefore my question is, between 1897 and 1898 and now you had had no occasion to, and have not, as matter of fact, attempted to make any sketch which embodied what Mr. Leavitt told you at that time?

A. I have had no occasion to for the purposes of any controversy such as this; but I have frequently had occasion to discuss
360 various forms of turbine and gearing with Mr. Leavitt during that period, and to make sketches such as you refer to.

Q. There is no question of your making various turbines during this period. That is not what I am asking. I want to know if you have tried to embody in a sketch the thing which you now say Mr. Leavitt told you in 1897 or 1898. Was there ever any occasion to recall what you have told us until very recently?

A. Yes, sir, there was; because we would disclose alternative forms of gearing and driving mechanism.

Q. But you have testified that your attention was not directed to the contention of Mr. Leavitt that he had communicated this to you in 1897 or 1898 until about a week ago?

A. What is that?

Q. Can you recall any particular details of any device that anybody else showed you in 1897 or 1898? Could you make a sketch of it at this time, from memory only?

A. I think I could, if it were connected with any specific suggestions and any developments of any importance, such as this.

Q. Isn't it a fact that this matter had passed out of your mind practically until your attention was directed to it about a week ago? You are a very busy man, are you not?

A. Yes, sir.

Q. Can you state positively that the sketch which you say Mr. Leavitt made for you in 1897 is identical in all respects with this sketch which you have made on the stand here today, this Exhibit 189?

A. Please define what you mean by "identical."

Q. Will you swear that you have not embodied in the sketch that you made here today, something additional to that which was disclosed in the sketch which you say Mr. Leavitt made in your presence in 1897 or 1898, without having that sketch before you?

Q. I mean, can you swear that you have not embodied in the sketch that you made here today, something additional to that
361 which was disclosed in the sketch made by Mr. Leavitt in your presence in 1897 or 1898, without having that sketch before you?

A. I can swear that I have not embodied anything additional.

Q. Have you a mental picture which you have carried all these years of the identical details of this sketch which Mr. Leavitt claims to have made for you in 1897 or 1898?

A. That expresses it. I have carried that mental picture all this time.

Q. Can you account for any reason why that should have been impressed upon your memory to such a remarkable extent?

A. I should say that it was because a Whitehead torpedo was a very important and very interesting development at that time, and Mr. Leavitt was a very keen, intelligent and progressive mechanical engineer, and was struggling very hard to improve the torpedo that was then known as the Whitehead. We had quite a number of conversations on the subject.

Q. Out of that number you are able to isolate this particular conversation during which he presented this sketch in 1897 or 1898?

A. He discussed the same mechanical device on numerous other occasions prior to 1898.

Q. This was not any new idea to you, the sketch which Mr. Leavitt was said to have made in 1897 or 1898?

A. It was new so far as applying the device to a torpedo was concerned, and the gearing mechanism by which the power was transmitted to the shafts was new to me.

Q. Now, you could not have fixed the date of that conversation with Mr. Leavitt without reference to the contract exhibit and those letters which were put in with it, could you?

A. Not closer than two or three years, possibly three or four years.

362 Q. Did you give Mr. Leavitt any ideas on the occasion of this visit which you have been speaking about his making to you in 1897 or 1898, which he did not have himself at the time the conversation started?

A. Not that I know of, with the exception of the details of the turbine construction.

Q. Your relations have always been very friendly with the E. W. Bliss Co., have they not?

A. Yes, sir.

Q. The Bliss Co. are licensees under one or more of your patents, are they not?

A. Yes, sir.

Q. Which of your patents are they licensees under, and what do the patents relate to?

Objected to.

The Court: I do not think you should go into that. (To witness). More than the one in evidence?

The Witness: All specified in the agreement.

The Court: Specified in that agreement. That is in evidence.

Q. One of them a turbine patent?

A. Yes.

Adjourned to 10:30 A. M., November 21, 1913.

363 BROOKLYN, 21 November, 1913.

Met pursuant to adjournment; as before.

Mr. Coles: May it please the Court, I desire at this time to move to strike out the testimony of Mr. Curtis on the ground that it is incompetent, and that the purpose and effect of it was to establish a situation in the prior art which the defendant in this case is estopped from doing, because the defendant's position here is that of a limited licensee under the Davison patent; the Government owning the patent the defendant having an implied limited license under the patent to manufacture for the Government only, is estopped from questioning either the validity or the scope of the patent.

Mr. Fraser: Does your Honor care to hear anything on this point?

The Court: Not at this time. You can argue that later.

Complainant excepts.

364 FRANK M. LEAVITT, recalled in cross-examination.

By Mr. Bick:

Q. Since you were on the stand yesterday have you been able to refresh your memory at all as to when these experiments were made by you, which you said were made six or eight months ago?

A. I haven't thought about the matter at all.

Q. I will direct your attention to Exhibit 11, being in folio F, page 38, and ask whether that in any way refreshes your memory?

A. Do you want me to read this letter all through to find some thing?

Q. You notice, do you not, on page 40, that that letter was signed by you?

A. Yes, I note that the letter was signed by me; I think it was.

Q. And that related, did it not, in substance, to the position of the British representatives of the Whitehead Company?

A. Yes.

Q. And the refusal of the Department to permit them to inspect the balanced turbine; is that right?

A. Yes.

Q. Isn't it a fact that it was because of this refusal on the part of the Bureau of Ordnance that you then began experimenting with an unbalanced turbine in the hope that you could substitute it for the balanced turbine, and disclose it to the English representatives of the Whitehead Company?

A. Why, it is very probable.

Q. Was there any discussion at that time with reference to that matter, which would enable you to state more positively?

A. There has been so much discussion at all times that I can't remember any specific discussion about this point. We have talked these points over and talked them over, and it is really impossible for me to specify any special conversations or discussions.

365 Q. I refer to discussions had between you and the other officers of the Bliss Company on this point?

A. I can't specify any specific conversations or discussions.

Q. Do you know what was the object which you and the Bliss Company had in mind in experimenting with an unbalanced turbine at that time, when the balanced turbine had already been submitted to the Government, and was being installed in the torpedoes?

A. Why, I think I can say that the object was to show that it didn't make any difference whether the turbine was balanced or whether it was unbalanced.

Q. Was that the only reason?

A. The only reason for trying the experiments, do you mean? I think I have answered it.

Q. Wasn't it also for the reason that you felt that under the relations of the Bliss Company with the Department that you could not exhibit the balanced turbine, and that you therefore desired to find a substitute for it?

A. It is very possible and very probable that the experiments were carried on with a view, in case we were stopped, that we would have something to substitute.

Q. In your direct examination I believe you stated that you were the inventor of the torpedo which is on exhibit here, and the existing type of torpedo?

A. Yes, I was.

Q. Is it not a fact that Mr. Page claimed the credit for designing what we are calling the balanced turbine?

A. I believe I stated on my direct examination that Mr. Page could have that credit.

Q. He could have it?

A. Yes.

Q. At the time that Mr. Page claimed to have been designing the balanced turbine he was doing it practically without your assistance and knowledge?

A. You mean the original balanced turbine?

366 Q. Yes; the one for which the drawings were made at the end of 1906?

A. That is correct.

Q. You don't want to give the Court to understand or to assume that during the time that these torpedoes were being improved and perfected that no assistance was rendered to you and no suggestions made by the naval officers of the Government toward perfecting the machine?

A. There was absolutely none; absolutely none.

Q. Never a suggestion made by a naval officer to furnish a single thing that was adopted in the torpedo?

A. Not a single suggestion; not a single thing that was adopted in the torpedo; not to the size of a screw.

Q. But were any suggestions made as to any way of perfecting the torpedo?

A. Not a single one.

Q. You never had any conversation with any of the Government naval officers about perfecting or looking towards the perfecting of any part of it?

A. Yes; I had a great many suggestions; I had a great many such conversations.

Q. And isn't it a fact that many of those suggestions were considered by you and used by you toward perfecting the torpedo?

A. There were a great many of them considered by me, but not a single one was ever used by me.

Q. It is a fact is it not, that there was no contract made for the manufacture of torpedoes from 1905 to 1909; is that right?

A. I believe that is correct.

Q. During this period of 1905 to 1909 what was being done as regards the perfecting of a torpedo?

A. There were so many things being done that it is almost impossible to specify.

Q. To sum it all up, during that time you were working on the torpedo to perfect the various parts to get a torpedo which
367 would meet the requirements of the Government?

A. I was; I was sweating blood.

Q. Isn't it a fact that during that time you were constantly in communication with the naval officers, and suggestions were being made both by you and by them as to how the same could be perfected?

A. Any quantity of them.

Q. And they would point out to you various deficiencies as they considered, in the torpedo?

A. That is correct; and it was up to me to correct them.

Q. That is, you would do the practical work in connection with the corrections. Have you or the Bliss Company a complete set of working drawings of the existing type of torpedo?

A. We have.

Q. Do you know whether any such drawings have ever been shown to any one outside of the officers of the Bliss Company and the United States Government?

A. Why yes; there have been details shown to contractors, different people where it was necessary to show them.

Q. Those were the employes of the Bliss Company?

A. Not always.

Q. Of the Government?

A. Not always.

Q. Of whom?

A. Well, parts which are furnished by outside firms; we have to show the details of drawings at times.

Q. But they were really employed by the Bliss Company to make the various parts to go into the torpedo; that is what you mean?

A. In furnishing material and various things; drawings have to be shown around.

Q. But they were your agents to perfect these various little parts to go into the machine?

A. There weren't any agents; they supplied material, and they had to have drawings so that they could supply the material; things of that kind.

Q. But you would never show to these contractors, as you
368 call them, the complete set of working drawings, for the entire torpedo?

A. No.

Q. Those parts that related to the parts that they were to do?

A. Certainly.

Q. Was any complete set of working drawings for the entire torpedo ever shown to the representatives of any foreign country?

A. They certainly were not.

Q. Is there any other set of these drawings, these working drawings existing at the present time, other than the set which is in the possession of the Government?

A. No.

Q. Do you know whether there is any public document which discloses the complete mechanism of the existing type of torpedo?

A. There is no one complete document that does.

Q. Do you know whether there is any single patent foreign or domestic, which discloses the complete mechanism of the torpedo as it at present exists?

Mr. Platt: What is the relevancy of this, if the Court please? We are not being sued here to restrain us from showing the torpedo. We are being sued to restrain us from showing certain devices.

The Court: He may answer that.

Exception.

A. Any one single patent?

Q. Any one single patent?

A. Certainly not.

Q. Was the balanced turbine torpedo, which you said you observed

the sheer in, built according to the Torpedo Station design, 117-E, or according to what has been referred to as Mr. Page's design?

A. Do you mean the first one? There have been several.

Q. I believe in the spring or summer of 1907 you say that in experimenting with torpedoes you noticed a sheer in the torpedo. Is that right?

A. Yes.

Q. Was that balanced turbine which was installed in that torpedo one built according to the design furnished in 117-E of the Government, or Mr. Page's design?

A. It was according to our design; the Bliss Company's design.

Q. When you refer to the Bliss Company's design you mean the one that Mr. Page claims the credit for designing?

A. I haven't heard him claiming any credit.

Q. That you gave him the credit for.

A. All right; put it that way.

Q. Mr. Page is not an engineer, is he?

A. Well, I don't care to answer that question without consulting Mr. Page.

Redirect examination by counsel for defendant.

By Mr. Fraser:

Q. You testified concerning the inability of the first torpedoes made under the 1905 contract, to reach the full specified range of 3500 yards. Will you please explain a little more in detail what were the successful torpedoes made under that contract, and what was their behavior so far as concerns that question of range?

Mr. Bick: Objected to as not being proper redirect.

The Court: Well, go on.

Q. (repeated.)

A. The first 50 torpedoes were tested and failed to run the full contract range. 10 of those torpedoes were taken over by the Government for experimental purposes, as I remember it, without having passed the specifications as to range. That was before the range was reduced; the other 40 were passed under revised specifications, to reach the range 3000 yards; the remaining 250 were brought up to—well, way beyond the 3500 yard range, by the introduction of the Armstrong superheater. The original 50, as I remember it, had what we call the inside superheater, and we introduced this new type of superheater which increased the efficiency 50 per cent., I think it was; in other words, we increased the range with that superheater about $\frac{1}{2}$ as much again as—we increased the efficiency of the turbine $\frac{1}{2}$ as much again by the introduction of that superheater. On the original tests, the dynamometer tests of the engines were practically the same in the first 50 torpedoes, and the last 250, that is, the efficiency test of the dynamometer showed them to be just the same; but the increase was attained by introducing the outside heater, which enabled us to get a much higher heat.

Q. Which type of engine was in the first 50, and which type was in the remaining 250?

A. The so-called unbalanced type, as I remember it, was in the first 50, and the so-called balanced type was in the remaining ones.

Q. The Armstrong superheater was in all of the 250?

A. It was.

Q. So that between the first 50, which could not reach the contract range, and the next, or final lot, which did reach and exceed that range, you made two changes in construction, namely, changing to the so-called balanced turbine and changing from the inside superheater to the outside or Armstrong superheater. Is that correct?

A. That is correct.

Q. Did you make any tests or were any tests made to determine what would be the range of the torpedo with the change to the so-called balanced turbine, but without the Armstrong superheater?

A. Yes.

371 Q. Where was that done, and when?

A. It was done at Key West; I don't remember whether we made the tests at Sag Harbor or not; I know they were made at Key West; I went down there to make those tests, among others.

Q. Was that at the Government testing ground there, from the Government Ship?

A. From the Government ship.

Q. Naval officers were present, and participated in those tests?

A. That is correct.

Q. Did you also make dynamometer tests, comparing the unbalanced turbine, like those in the first 50 torpedoes, with the so-called balanced turbine, like those in the later ones?

A. I did.

Q. With what result?

A. They were practically the same.

Q. What was the result of the test at Key West with the torpedo containing the balanced turbine, but with the old form of superheater?

A. There was no appreciable difference in the performance.

Q. Do you remember specifically what range that torpedo gave?

A. 3000 yards was the effective range.

Q. What naval officers were present at those Key West tests?

A. Mr. Davison, Lieutenant de Friez, Lieutenant Thompson.

Q. Was any official report made of those tests?

A. There was.

Q. I show you a paper and ask you to identify it. What is that paper?

Objected to on the ground that it speaks for itself.

The Court: Let him state in a general way.

A. It is a report made by Mr. Davison to the Chief of the Bureau of Ordnance.

372 By Mr. Bick:

Q. Give the date, please.

A. It is dated March 16, 1907.

By Mr. Fraser:

Q. From where?

A. From the U. S. ship Vesuvius, Naval Station, Key West, Florida.

Mr. Fraser: I ask to have that report marked in evidence.

Mr. Bick: We don't object to it as a copy, but we do object as immaterial, because it was made subsequent to the submitting of the 117-E and the furnishing of a design by the Government to the Bliss Company.

The Court: It may be marked in evidence.

Exception.

It is marked Exhibit 141.

Mr. Platt: We should like to have it appear that the endorsements go with it.

Mr. Bick: The same objection applies to the endorsements, and the same exception.

Q. You have been asked concerning the troubles had with the sheer and other erratic performances of the torpedo. Will you state how those difficulties were finally overcome?

Mr. Bick: Objected to as not proper redirect.

The Court: I will take it. You can cross-examine about it, Mr. Bick.

Mr. Bick excepts.

A. There are quite a number of things which caused the erratic performances of the torpedo. One which affected those 300 torpedoes was probably the fact that in designing it I had shortened the after shaft through which the air exhausts about 3 or 4 inches, for reasons which appeared to me good, and it took us nearly two years to discover that that was the cause of the trouble; it was a matter that could be cured, and was cured by an expenditure of a couple of dollars, and after we applied this remedy we had no further trouble on that score with those torpedoes.

Q. Just what did you do to correct that?

A. To go into detail as to what I did I would have to have a diagram, I think.

By the Court:

Q. Can't you do it in a general way?

A. Well, I have already, in a general way, said.

Mr. Bick: Objected to. I do not think it is proper redirect.

The Court: I will take it.

Exception.

By Mr. Fraser:

Q. Please, as well as you can, tell us just what change was made in that torpedo that corrected that thing?

A. I put in a bulkhead in the tail which prevented the exhaust

air from coming in contact with the after propeller. Shortening the shaft, as I did, allowed that exhaust air to come in contact with the after propeller, and by putting in a bulkhead there I corrected that. After that we had no more trouble, and passed those torpedoes through the inspection tests very rapidly.

Q. Please explain why letting the air get into the after propeller should have any detrimental effect?

Objected to as absolutely immaterial to the issues in this case, and not proper redirect, and entirely new material which has
374 not been gone into on either direct or cross-examination.

The Court: You can cross-examine him on it.

Mr. Bick: I except.

A. The two propellers revolving in opposite directions are so balanced in dimensions and in pitch that each neutralizes the action of the other, tending to rotate the torpedo and make it roll. If any air gets tangled up with one or the other it reduces the work done by that propeller, and throws it onto the other; so that there is an unequal tendency to rotate the torpedo. This action of rolling the torpedo can occur from various causes; that is, in this particular case, the exhaust air from the shaft, as I explained, is what causes the torpedo to roll. Now there may be, and are, other places where a leakage of air may cause the same trouble. For example, in our latest type of torpedo we had a very similar trouble; the torpedoes were erratic, and we found that, owing to the expansion of the air pipe leading from the heater to the nozzle of the turbine the nut which attached the pipe to the heater pot would get leaking air, and this air coming out would cause the torpedo to roll badly and would cause the erratic run. That was remedied by welding the pipe in solid in the heater pot. There are other causes. I could go into quite a number to illustrate that it isn't due to any one thing. It may be one thing, or it may be another.

Q. To make it more clear just what you did in introducing that bulkhead that avoided that difficulty with those 300 torpedoes, will you please produce a diagram explaining that?

The Court: You don't need that. The explanation is perfectly clear. I do not see any need of putting in a drawing here.

375 The witness's explanation of it is perfectly clear.

Defendant excepts.

Q. I show you patent of F. M. Leavitt, No. 741683, dated October 20, 1903, the application for which was filed February 9, 1899, and ask if that patent was granted to you?

A. Yes.

The patent is marked Exhibit 142 for identification.

Recross-examination by counsel for the Government:

By Mr. Bick:

Q. These experiments that were being made at Key West were made in the presence of Commander Williams and other officers, naval officers, were they not?

A. Not Commander Williams; he was not there.

Q. Was Commander Davison there?

A. Commander Davison was there, yes.

Q. During this time while the tests were being made suggestions were made constantly by the naval officers, to the representative of the Bliss Company, yourself, and by yourself to the naval officers, as to how many of the defects could be remedied?

A. There was plenty of talk about it.

Q. There was a general conversation going on all the time; and you were living on board the Vesuvius?

A. No.

Q. You were on board the ship most of the time, during the tests?

A. I was on there during the tests, certainly.

By Mr. Fraser:

Q. Was the introduction of this bulkhead at the suggestion of any naval officers?

A. It was not.

376 ARTHUR S. BROWNE, recalled, on behalf of the defendant, testifies:

By Mr. Fraser:

Q. I show you a certified copy of a British patent to Robert Wilson, No. 12,026, of 1848, and ask you to examine it and state whether you find anything disclosed in that patent which bears upon the discussion of counter-rotation turbines and gearing therefor, which you discussed in your early testimony in this case?

Mr. Coles: Objected to as immaterial, irrelevant and incompetent.

The Court: It is certainly a pretty broad requisition; but what is it?

Complainant excepts.

A. Yes, I do.

Q. Please explain the construction and show wherein it bears upon the matters discussed by you previously?

A. This patent is for improvements in certain kinds of rotatory engines worked by steam and other elastic fluids, part of which improvements are applicable to rotatory engines worked by water or by the wind, also an improvement in safety valves for steam boilers. In sheet 3 of the drawings is illustrated a rotary turbine engine having two turbine wheels which rotate in opposite directions, and these two oppositely rotating turbine wheels are connected by gearing to a single shaft, so that that shaft is run by the cooperative action of both turbine wheels and at a slower speed. I call attention to the description beginning at the 34th line on page 24 of the specification, which reads as follows: "As the two wheels G and R are impelled

377 "round in contrary directions one to the other, their axes F
"wheel-work of pulley-work) to one common axis as to turn
"that axis round with a slower motion produced by the concurrent
"action of both the axes F and Q which are turning round in con-

"trary directions. A suitable arrangement of toothed-wheel-work for that purpose is shown by way of example in the horizontal plan, Figure 3, where M and M' are bevel pinion fastened on the axis F of the wheel G and on the axis Q of the wheel Q respectively, and those bevel pinions turn to the two bevel wheels T and T' on the ends of the two horizontal axes V, V, and V' V', and on the other ends of those axes are two spur pinions S and S' for actuating a large spur wheel N on the horizontal axis O, which is that already mentioned as being a common axis, for it receives its motion and power with a much slower rate of revolution from the concurrent action of both the revolving wheels G and R, although those wheels revolve in contrary directions one to the other."

Mr. Fraser: I offer in evidence this patent as Exhibit 143.

Mr. Coles: I object, because this is an attempt indirectly prove the prior art.

The Court: We will mark it in evidence, subject to the objection. The patent is marked Exhibit 143.

Mr. Fraser: I have a certified copy of the file wrapper and contents in the matter of the patent to Davison; I do not think it is necessary to encumber the record by offering this. I submit to counsel for complainant for inspection. But there is one fact developed in this file wrapper that I want to bring out before the Court,
378 namely, that against this application the patent office cited the patent to Wheless, No. 818,987 of April 24, 1906.

Q. I show you a copy of the Wheless patent just referred to. Please explain it and state wherein, if at all, you find any resemblance therein to the so-called balanced turbine?

Same objection as before. Same ruling and exception.

A. This Wheless patent is for an automobile torpedo, and in Figure 9 it shows two turbine wheels rotating in opposite directions; one of them being connected with one set of propellers through a shaft, while the second turbine wheel is connected with the other set of propellers through a shaft.

This is described in the specification, beginning at line 82.

The Court: I do not know that this is necessary.

Mr. Coles: I move to strike out the testimony.

The Court: Presumably the Patent Office passed on it.

Mr. Coles: Yes; but they finally issued the Davison patent, notwithstanding that. We object as immaterial, irrelevant and incompetent. The Patent Office allowed the Davison patent notwithstanding this reference.

The Court: You can show what they said about it, if anything. Exception.

Mr. Fraser: I offer the Wheless patent as Deft's Ex. 144.

Mr. Coles: Has counsel for defendant offered the Davison
379 file contents in evidence.

Mr. Fraser: No, I don't think it is necessary.

Mr. Coles: Then I will have it marked for identification. It is marked Complainant's Exhibit 76 in evidence.

Mr. Coles: If the Court please, I move to strike out all the testimony of this witness, Mr. Browne, on the ground that it is incompetent, irrelevant and immaterial to any issue in this action; the evident purport and intent of the testimony being to establish conditions in the prior art tending to affect the validity and scope of the Davison patent. The defendant is estopped from raising those issues in this suit, because its position to the Government is that of a license under the Davison patent. I renew my motion in connection with this witness, in order to preserve the record.

The Court: I will take it subject to your objection.

Complainant excepts.

Cross-examination by counsel for Government (de bene esse):

By Mr. Coles:

Q. When you were retained by the defendant to testify in this case you understood that you were to give testimony with respect to the showing in the prior art of turbines moving in opposite directions, did you not?

A. Yes.

Q. You have been asked with reference to the disclosure in the British patent No. 12026 of 1848 to Wilson. That patent
380 doesn't make any pretence of disclosing or applying a balanced turbine to a torpedo construction, does it?

A. It does not.

Q. Isn't it a fact that, so far as your study of this case has gone, you have not found any public document which discloses the complete mechanism of the existing type of torpedo?

A. I have not.

Q. You have not found any single patent, either domestic or foreign, which discloses the complete mechanism of the existing type of torpedo, have you?

A. I have not.

Mr. Coles: I now renew my motion to strike out, in order to preserve our rights on the record.

Same ruling and exception.

Mr. Fraser: I ask leave to introduce one more documentary exhibit; a letter from Folio B, page 105, being a letter from the Naval Torpedo Station, dated December 29, 1906, signed by Albert Gleaves, Commander, addressed to the Bureau of Ordnance, and ask that it be marked Exhibit 145. I see a reference to a sketch, but I have no evidence that the one that follows in the Folio is the one referred to, and I do not care to offer the blue print.

Mr. Coles: I object to the introduction of this letter unless the whole letter of December 29, 1906, which appears on pages 105 and 106 of Folio B be introduced; and also the blue print following page 105, which accompanied said letter.

The Court: I think it ought to go in.

It is marked Exhibit 145.

381 LEAVITT MERSEREAU, being duly sworn and examined as a witness for the defendant, testifies:

Direct examination by Mr. Fraser:

Q. Are you in the employ of the Bliss Company?

A. Yes, sir.

Q. How long have you been in their employ?

A. 8 years.

Q. Where do you reside?

A. In Sag Harbor.

Q. What are your duties at Sag Harbor?

A. I have charge of the torpedo testing station.

Q. How long have you had those duties?

A. 8 years.

Q. Have you, during that period, particularly, been present during tests of torpedoes?

A. Yes, sir.

Q. Please explain briefly how such tests are and have been conducted?

A. The torpedo is charged and put in a launching tube and fired out; it goes down to a predetermined depth and runs through four nets placed a thousand yards apart, and then the run stops.

Q. How do you determine whether it has run the correct course and kept in correct depth?

A. The nets are about 15 feet deep and, as the torpedo goes through each net, it makes a hole; then the net is pulled up and measured down from the top to find the depth; also the deviation from the center.

Q. How about determining the speed?

A. The man at each net, as the torpedo leaves the tube, he starts his watch from the splash, and as it goes through his net he stops his watch.

Q. And from those data you calculate the speed?

A. Yes, sir.

Q. Is there any other way of determining whether the torpedo runs straight, except by measuring the holes in these nets?

A. You can follow them with your eye.

382 Q. In what way, the torpedo being under water?

A. The exhaust air comes up and makes a white wake on the surface.

Q. Were you present at some tests made with an experimental 18-inch torpedo, last June, July and August?

A. Yes, sir.

Q. Please look at the torpedo part that is here and state whether you are able to identify that as being part of the experimental 18-inch torpedo that you tested at that time?

Mr. Youngs: Objected to as incompetent and immaterial, and irrelevant to the issues, it being subsequent to the filing of the bill of complaint.

Counsel argue the matter.

The Court: From the argument that has been made I agree with

the Government at present; but, in the way that I have tried this case and have taken Mr. Leavitt's statement about this, I don't see any objection to taking the experiment in the same way, and for the same purpose. Whether it amounts to anything when you get all through is a matter that I am reserving for consideration.

Complainant excepts.

Q. Will you please examine the machine and state whether you identify it?

Mr. Youngs. We object on the ground that it is neither marked for identification, nor is in evidence.

The Court: Well, go on.

Exception.

A. I can identify it as the torpedo that was shot on June 17th.

The machine identified by the witness is marked 146 for identification.

383 Q. Please state whether the experimental torpedo containing this device which you have just identified was put through a series of tests at Sag Harbor?

A. It was.

Q. Were those tests of the same character as the regular Government tests, for the acceptance of torpedoes.

A. They were.

Q. Did you make any note as to the performance of the 18-inch torpedo containing this device which you have just identified, during those tests?

A. Yes, sir.

Q. Can you produce the record that you then made?

A. Yes, sir.

Q. During the tests of torpedoes for the Government during the past eight years, exactly what have been your duties at Sag Harbor?

A. I get the torpedoes ready for firing, fire them, and if anything goes wrong I find out what it is and make adjustments and get them to run correctly till they make the passing shots.

Q. What experience have you had during that time in determining the performance of the torpedoes during the run?

A. I have been in charge all that time and any shot that went wrong it was up to me to make it right.

By the Court:

Q. What are your qualifications. Are you a scientific man.

A. I have been a draftsman.

Q. For the Bliss Company?

A. I have been there and in other concerns.

By Mr. Fraser:

Q. What study have you made of the torpedo?

A. I have made a very complete study of it so far as the running goes.

Q. Do you understand the mechanism all through the torpedo?

A. Yes, sir.

Q. If anything goes wrong do you know how to make it right?

A. Yes.

384 Q. You have to understand all the various adjustments in order to correct any irregularity in the performance, have you?

A. Yes.

Q. Regarding the determination of the course of the torpedo what experience have you had in that.

A. If the torpedo goes wrong, goes off to the right or left, I have to correct the gyro and make it run straight.

Q. I mean in determining whether it goes right or wrong, how do you determine that?

A. Well, that is by the tags that come back from the nets. They show whether the torpedo has gone off its course.

Q. Have you, yourself, made any examination of the torpedo nets during such tests?

A. Yes, I have been out there when the torpedo has run through a net.

Q. You have been stationed at the net?

A. Yes, sir.

Q. During these tests of this experimental 18-inch torpedo containing the mechanism here identified, who was present beside yourself?

A. Lieutenant Glover and three gunners.

Q. Any others among the Bliss Company people?

A. Mr. Dieter witnessed some of the tests.

Q. Anybody else?

A. Not that I remember.

Q. Was Mr. Page there during any of those tests?

A. I don't think he was; I can't recall.

Q. When the Naval Officers are taking data during these tests of torpedoes how do they get the facts on which they make their report?

Mr. Cole: Objected to as hearsay and as incompetent.

The Court: Let us have the answer.

Exception.

A. They watch the torpedo from the launching point, from the barge.

385 Q. How do they know where it goes through a net?

A. By following the wake.

Q. Any other way?

A. The tickets come back.

Q. When the tickets come back from the net men do they read the records from those tickets?

A. Yes sir.

Q. The same as you did?

A. Yes, sir.

Q. Was that true during the tests of this particular torpedo?

A. Yes, sir.

Q. Then they had the same source of information that you had

as to the particular point where the torpedo made holes through the nets?

Objected to as calling for a conclusion and incompetent.

Objection sustained.

Q. Where were the Naval Officers stationed during those tests?

A. On the barge.

The Court: He has only mentioned one, and that was Lieutenant Glover.

Q. Where was he stationed during those tests?

A. On the barge.

Q. Where were you stationed?

A. On the barge.

Q. Were you right together?

A. Yes, sir, we stood together at times.

Q. He took down data during those tests, did he?

A. Yes, sir.

Objected to as calling for a conclusion, and incompetent, and Counsel moves to strike the answer out.

Q. Did you see him take down the notes?

A. Yes, sir.

By the Court:

Q. Did you see his notes?

A. Yes, sir, I have seen them.

386 By Mr. Fraser:

Q. You took down notes at the same time?

A. Yes, sir.

Q. You both took notes then at practically the same time during each of those runs, and when you were both present?

A. We did.

Q. Will you please produce your notes of those runs?

Mr. Bick: Objected to as immaterial.

Mr. Coles: We object further on the ground that it doesn't appear that he knows the extent or character of the notes taken by Lieutenant Glover, nor does it appear that the notes he took were notes on the same subject as those taken by Lieutenant Glover.

The Court. Let me see these notes.

They are produced to the Court.

By the Court:

Q. These were the notes that you took at the time?

A. Yes, these were the regular notes taken at the time.

By Mr. Fraser:

Q. Please tell us how that particular experimental torpedo behaved during those runs?

A. I should call it a normal running torpedo.

Q. Did its operation differ in any perceptible way from the oper-

ation of the ordinary Mark 7 torpedoes that were being submitted to the Government and that were accepted as passed?

Mr. Bick: Objected to as calling for a conclusion.

The Court: It is a conclusion; if you want to ask him whether the torpedo rolled, go on.

387 Q. As far as concerned the initial roll of the torpedo, did you notice any difference?

A. No difference at all. The initial roll was no different from the Mark 7.

By the Court:

Q. What did this torpedo do about rolling, if anything? Did it or didn't it roll? If it did, how much of a roll, if you know?

A. In leaving the gun?

The Court: I don't know.

By Mr. Fraser:

Q. Then, in leaving the gun?

A. It didn't roll.

Q. As it passed through the air and before it entered the water did you notice any roll?

A. No, sir.

Q. If any roll had occurred did you have an opportunity to notice it?

A. Yes, sir.

Q. What experience have you had in testing the Mark 7 torpedo?

A. All this summer; since March.

Q. About how many such torpedoes have you tested?

A. 179.

Q. In testing these torpedoes was it possible to see during the launch and before the torpedo entered the water whether there was any initial roll?

A. Yes.

Mr. Bick: Objected to as relating to two torpedoes apparently that were made after the commencement of this action; that is, this summer, and it is not pertinent to the issues in this case.

The Court: This is about as remote as anything you have gone into.

Exception.

388 Q. Was there the same opportunity to see that during the testing of this particular experimental torpedo?

A. Yes, sir.

Q. Regarding the question of initial roll how did this experimental torpedo compare with the regular Mark 7 torpedo?

A. The same roll.

Q. Concerning the launching of the torpedo was there any difference in the manner of launching, or in the conditions of the launching, in the testing of this particular experimental torpedo, and the testing of the regular Mark 7 torpedo?

Same objection, ruling and exception.

A. They were both the same; both conditions were the same.

Q. From the time the torpedo entered the water please compare the performance of this experimental torpedo with the performance of the regular Mark 7 torpedo?

A. The dive and the run looked just the same; the appearance of the wake was the same; as far as you could see, everything was alike.

Q. How about the deviation at the nets?

A. Some of the runs were off, but I afterwards corrected that, and they made passing shots.

Q. In what range were these tests made?

A. 4000 yards.

Q. Is that the same range that is used for the passing of a Mark 7 type torpedo?

A. Yes, sir.

Q. Were these shots with this experimental torpedo, that you say were passing shots, the same in number and in conditions that would have been accepted, according to custom, if this had been one of the regular Mark 7 torpedoes?

A. The only difference was that two shots were made, instead of three; successful shots.

Q. That is, with the passing torpedoes under the contract three successful shots were required, and with this particular experimental torpedo you made two successful shots; is that it?

A. Yes, sir.

Q. Just what do you mean when you say that this made two successful shots instead of three?

A. Some of the Mark sevens have to make three, and others make one; I made two with this.

Q. Please look at your memorandum, and refresh your memory and see whether that is correct?

Mr. Bick: Objected to.

By the Court:

Q. Do you want to look at your memorandum? Do you want to change your testimony in any way?

A. I can change it in this way: That we didn't make curved fires with it; we only made the straight shots.

Mr. Youngs: I object and move to strike out the whole testimony on the ground that it is absolutely immaterial to this case; it is all subsequent to the date of the filing of the bill herein, and has nothing whatever to do with it; neither is it pleaded in the answer. It is no part of the defense.

The Court: I am inclined to grant the motion without any further argument, but I will let it stand for the present, subject to objection.

Complainant excepts.

Cross-examination by counsel for the Government.

By Mr. Youngs:

Q. If I understand you aright, you are Mr. Leavitt's nephew, are you not?

A. Yes, sir.

390 FRANK C. B. PAGE, recalled for the defendant, testifies:

Direct examination by Mr. Fraser:

Q. Concerning the matter of compound regulation of air so called, please tell the Court what, if any conversation you had with officers of the Bureau of Ordnance concerning that proposal?

Objected to as not being proper re-direct.

Mr. Fraser: We are recalling the witness; it is for something that developed in the cross-examination of Mr. Leavitt.

The Court: Go on.

Exception.

A. Between December and February, or about February, I had several conversations with Admiral Twinning, and Capt. Norton at Washington in the Bureau of Ordnance, regarding the question of compound regulation or double regulation of the air pressure in the torpedoes now under contract. These talks were brought about by a misunderstanding which had occurred as to the interpretation which should be placed upon the specifications covering the dynamometer tests of the torpedo, and owing to the interpretation that was placed upon the specifications by the Bureau and to which we were compelled to accede, it was necessary for us to request that the specifications be modified, as we could not produce in these dynamometer tests the horse power, the amount of horse power insisted on by the Government. In objecting to our request the officers, both Admiral Twinning and Capt. Norton, indicated that they believed——

Mr. Youngs: We object to what they indicated. Let him state what was said.

391 A. (Cont.) They stated that they believed that if we had a double regulation of air in the torpedo instead of a single regulator, we would be able to meet the specifications without any change being made in them. At these several times I told the gentleman that it was quite evident that a double regulator would produce more uniform regulation of air pressure; but that it had no relation whatever to the question of the horse power produced; and I further stated to these gentlemen that we were not objecting to the idea of putting a double regulator in the torpedo; but that it was a question of detail of design, the difficulty being to so design and shape the parts of the double regulator as to permit of its being incorporated in the present design of Mark 7 torpedo, without making a great many other changes. In this connection I stated that if the Bureau had a design of a double regulator we would be glad to have them furnish it to us, and we would instal- it in the torpedo. They told me they did not have a design which was applicable to the torpedo, but urged upon me the desirability of doing everything possible to produce such a design.

Q. Did the naval officers ever produce any design for this double regulator?

A. Not to me; not to my knowledge.

Q. At the time when they first suggested it was this scheme of

double regulation of air or reduction of air anything new to the Bliss Company?

Objected to as immaterial.

A. No.

392 The Court: What is the witness talking about? Is he talking about his own knowledge, or the knowledge of anybody connected with the Company? You didn't ask him about his knowledge.

Mr. Fraser: Well, I will limit it to his own knowledge.

A. I would say that it was a self-evident proposition; a self-evident means of uniform regulation from high to low pressures.

Mr. Coles: I object and move to strike that out, as it has nothing to do with the question of knowledge. It is sometimes the most self-evident things that are patented.

The Court: Strike it out.

Defendant excepts.

Q. You have heard the testimony to-day of Mr. Mersereau concerning some tests of an experimental 18-inch torpedo at Sag Harbor?

A. I have.

Q. Will you look at the machine that is here marked in evidence, Exhibit 146, and state whether you identify that particular mechanism?

A. I have looked at that mechanism, and I can identify it.

Q. What do you know about the building of that particular mechanism?

Objected to as wholly immaterial.

Q. Do you know where it was built, and when?

Same objection.

Objection overruled.

Exception.

A. This engine was built at my direction the early part of this year.

Q. Were you present at Sag Harbor at any of the tests of the torpedo containing this mechanism?

A. I was.

393 Q. How many of such tests and at what time?

Mr. Bick: Objected to as attempting to impeach the testimony of their own witness, Mr. Mersereau, who said that Mr. Page was not there.

The Court: He said Mr. Page was not there, so far as he recollected.

Mr. Bick: The tests were made by the last witness.

The Court: Yes. It just impeaches his recollection. Answer the question.

Exception.

A. I was there during the last two sets of test, in June and July.

Q. What did you observe as to the performance of that experimental torpedo, during those tests?

A. My observation was directed specially to the action of the torpedo leaving the tube, and before it struck the water.

By the Court:

Q. Where were you? Were you reviewing these operations from the same vessel that Mr. Mersereau was?

A. Yes; from the upper deck, right over the gun. My observations were that the torpedo did not heel or what is otherwise referred to in these proceedings as the initial roll, during the flight from the gun to the water.

By Mr. Fraser:

Q. In that respect did you observe any difference between the performance of this experimental torpedo and the performance of the regular Mark 7 torpedoes?

A. I did not.

By the Court:

Q. Referring to Mr. Leavitt's embarrassment in answering the question, are you an engineer?

394 A. I shall have to answer that question the same way I did when I was asked the question by a very well known engineer with whom I was doing some business, and merely said that I have not graduated from any technical school; I have had some years' experience in engineering business; and as to my qualifications I would have to rely on questions in order to show my familiarity with the engineering business.

Q. How long have you been connected with the E. W. Bliss Company?

A. Since 1885.

Q. You have had no scientific education, and had had none before you went with this Company?

A. No.

Q. And whatever knowledge of engineering you have acquired you have acquired in this work?

A. In the last 28 or 29 years, I have been very closely associated with all engine work and the engine designing business.

Cross-examination by counsel for the Government.

By Mr. Coles:

Q. In reference to the double air regulator, the Bliss Company finally adopted the double air regulator after it had been urged to do so by the Bureau and the Inspector of Ordnance at your works for some time, did they not?

A. Yes, they did.

Q. While you were having those conversations with the Inspector of Ordnance and the Bureau officers, at which they were urging the Bliss Company to adopt the double air regulation upon the ground

that it would increase the uniformity of horse power throughout the run, you had enough mechanical knowledge to know just what they were talking about, didn't you?

A. I thought I comprehended what they were trying to tell me.

Q. You thought you were sufficiently skilled in the art to
395 understand the disclosures which they made by their description of that air regulation; is that right?

A. I didn't understand that they had made any disclosures; certainly not to me.

Q. But you understood what they were trying to tell you; what they were telling you?

A. I understood what they were telling me, yes.

Q. Then you comprehended at that time the description which they gave you of the uses and advantages of this double air regulator, as they claimed?

A. They didn't give me any description of a double air regulator at all.

Q. You comprehended at that time what they were talking about, and you said on direct examination that the results of its operation and advantages were obvious. That is correct, isn't it?

A. Correct.

Q. After you understood the advantages of double air regulation in its application to a torpedo for the purpose of maintaining uniformity of horse power throughout the run, the matter of the space in which that device was to be located in the torpedo was a mechanical matter solely, wasn't it?

A. Every question pertaining to the details of the torpedo is a mechanical matter, yes.

Q. But the matter of locating it in a torpedo with reference to convenience regarding other parts was a mechanical matter?

A. Why, there are a great many difficult questions coming up in connection with it; the question of additional weight, placing the weight differently; it was not a simple problem at all.

Q. I know; but the problem of location is one that you would turn over to a mechanic to work out from observation of the available space, isn't it?

A. No; we would turn it over to a skilled engineer; the
396 best brains we could have in our establishment weren't any too good to produce the result.

Q. Who did you turn this matter over to, as to where the double air regulator should be located?

A. Mr. Dieter.

Q. It was too small a problem for yourself or Mr. Leavitt, wasn't it?

A. Well, I would hardly say that.

Q. It is a fact, is it not, so far as you know, that the installation of the double air regulator in the torpedo mechanism for the purposes for which it is employed in the existing type of torpedoes, which your Company is now building, but has not yet delivered to the Government, is the first instance of the use of such double air regulator in connection with torpedo mechanism, isn't it?

A. I don't believe it is.

Q. So far as you know?

A. No; to my knowledge, it is not.

Q. Have you any knowledge that at the time this double air regulator was being discussed between you and the Bureau officers that the exact type which you have embodied in the existing type of torpedo was in use anywhere else in connection with a torpedo for the purposes for which it is now used?

A. I would say yes, such a device was used for the very purpose that this is used; in a torpedo.

Q. Where?

A. Well, it is disclosed in an old patent.

Q. What patent?

A. A patent to Lay, an old Lay patent torpedo.

By the Court:

Q. Is that the one in evidence, do you mean?

A. I don't know whether it is evidence, or not.

Mr. Fraser: There are two Lay patents here.

397 By Mr. Coles:

Q. You didn't know that at that time, did you?

A. I don't know whether I was familiar with that particular patent or not.

Mr. Fraser: It seems to be uncertain whether this particular machine, Exhibit 146, is in evidence or merely marked for identification.

The Court: It is marked for identification.

Mr. Fraser: I then offer it as an exhibit.

Objected to as before.

The Court: I will mark it in evidence now, and then I will let you know Monday whether I will strike it out, and strike out all reference to it.

Mr. Coles: I wish at this time to move to strike out all Mr. Page's testimony with reference to any experiments concerning this Exhibit 146.

The Court: Yes, on the same grounds.

Mr. Fraser: One other thing: We understand that at the tests of this experimental 18-inch torpedo at Sag Harbor data were taken by the naval officers there present; that such data were embodied in their report, as was the usual custom, and that that report is on file. We should like to ask the other side to produce that report, or a copy of it, here in Court next Monday, in order that we may have it in evidence.

The Court: Yes. That is your case?

Mr. Fraser: That is our case, so far as all excepting the last six items are concerned, which rest solely upon the National Defense Act.

Adjourned till Monday, November 24, 1913, at 10.30 A. M.

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BROOKLYN, November 24, 1913—2 P. M.

Met pursuant to adjournment as before.

The Court: It seems to me on reflection, that it is just as important for the defense to put in the record its defence on these remaining items as on the four in which the Government claims to take something by virtue of the contract; therefore I will hear your evidence as to the remaining items.

FRANK M. LEAVITT, recalled for the defendant, testifies:

By Mr. Fraser:

Q. Some testimony has been offered concerning suggestions as to the vertical rudders of the torpedo. What have you to say as to the construction of the vertical rudders and their location and proportions as they are in the existing type of Bliss-Leavitt torpedo? Do those embody any suggestion from the Bureau or otherwise?

A. They do not; the rudders in the Mark 7 type of torpedo are forward of the propellers; these are copied from what is known as the Woolwich tail; that is it is the British Admiralty type of torpedo tail.

Q. From whom did the Bliss Company get the design of that Woolwich tail, and when?

A. We got the design from the Whitehead Company 8 or 10 years ago; I don't remember just the date.

Q. As to the method of starting as to which it seems to be claimed that some suggestion was made by the naval authorities, in this connection I ask you if you identify Complainant's Exhibit 20, page 16?

A. Yes, I do.

399 Q. In this letter you say "The Bureau found fault with our starting mechanism and wanted something simpler and requiring less attention. If the Bureau had suggested the use of a breaking tube, this device would clearly have been its sole property". Please explain what you meant in that letter by the use of a "breaking tube"?

A. That was the means of starting the torpedo by means of cutting a hole in a tube and allowing the air to escape in such a way that it started the engine going.

Q. Was that used in any of the Bliss-Leavitt torpedoes you made for the Government?

A. Yes.

Q. I show you a copy of Patent No. 880030 to F. M. Leavitt, and ask you whether that illustrates the construction you have referred to?

Mr. Coles: Objected to as immaterial.

A. Yes, that shows the construction.

Mr. Fraser: I offer it in evidence as Exhibit 147.

Mr. Coles: Admission of this patent is objected to as immaterial. The Court: It may be marked.

Complainant excepts.

It is marked Exhibit 147.

Q. Is that starting means used in the present type of Bliss-Leavitt torpedo?

A. No, it is not.

Q. What is the starting means now used?

A. We use a hook similar to the Whitehead starting mechanism.

Q. Was that hook designed or communicated to you by the naval officials?

A. It was not.

Q. From what source did the Bliss Company derive it?

A. It was copied from the old Whitehead torpedoes that we have been building for a good many years.

400 Q. Now as to changes in the depth engine; what was the construction of the depth engine that was criticised or objected to by the officials of the Bureau of Ordnance?

A. It was practically the same as had been used in the Whitehead torpedo for a great many years; it was copied from the standard construction of the Whitehead.

Q. I show you a red book issued by the United States Navy descriptive of the Whitehead torpedo, and ask you to point out in that book any plate or illustration showing that old construction of depth engine?

Mr. Colés: Objected to as immaterial.
Same ruling and exception.

A. Plate 13-A shows the construction of the Whitehead engine.

The book is offered in evidence as Exhibit 148.

Mr. Colés: We object to any testimony with reference to this book, and move to strike out the answer on the ground that the book is not a public document and if it came into the possession of the Bliss Company it was in a confidential capacity incident to the work under the contract.

The Court: I don't know what it is; there is no proof as to when it came into the possession of the Bliss Company, if ever before this action.

The Court: I don't know that it is material anyway on the proofs; it is just offered by the witness as a design?

Mr. Fraser: That is all.

The Court: I will accept the exhibit.

Complainant excepts.

The book is marked Exhibit 148.

401 Q. I show you a letter from the Chief of the Bureau of Ordnance to the Bliss Company dated March 16th, 1910, and ask if you identify that letter, and if so, whether that is a letter expressing the Bureau's objection to that engine?

Mr. Colés: Objected to, as the letter speaks for itself.

The Court: Yes, the letter certainly speaks for itself.

By the Court:

Q. Is that the subject matter of the letter?

A. That is in regard to that defect which they mentioned.

By Mr. Fraser:

Q. At that time how long had that particular type of depth engine been in use in our Navy so far as you know?

Objected to as immaterial.

Same ruling and exception.

A. Since 1891.

The letter is offered in evidence as Exhibit 149.

Mr. Coles: Objected to on the ground that it is irrelevant and immaterial.

Objection overruled.

Exception.

It is marked Exhibit 149.

Q. What was done concerning the Bureau's objection to the depth engine?

A. A Board was appointed to discuss that, and other matters, which met at the office of the Bliss Company, and, after discussing this defect, as they called it, they presented a drawing to us of the present Whitehead construction of engine; I didn't like 402 the looks of it for our purpose and suggested an alteration in—or a new design of depth engine, which I thought would overcome their objection: they seemed to be satisfied with it, and asked me to go ahead and develop it and submit a working drawing which I did. That was adopted and put in the torpedoes.

Q. I show you what purports to be the report of a Naval Board, the report being dated March 21st, 1910, and ask if you identify that, and if so, is it a report of the Board you referred to?

A. That is a copy of the report of the Board to which I referred.

Mr. Fraser: I offer that as Exhibit 150.

Mr. Coles: Defendant's Counsel does not object to the report of the Board, but it is insisted that if the report is offered it be accompanied by the following letters, which relate to it:

Letter of April 28, 1910, from the Bliss Company to the Bureau.

Letter of March 31, 1910, from the Bureau to the Bliss Company.

Letter of April 2nd, 1910, from the Bliss Company to the Bureau.

Letter of March 29th, 1910, from the Bliss Company to the Bureau.

Complainant's Counsel here requests Defendant's Counsel to produce these letters and offer them in connection with this report.

Mr. Fraser: The letter of April 28th, 1910, is already in evidence as Exhibit 62; the letter of March 31st, 1910, is in evidence as

403 Exhibit 63: I have here a manifold copy of the Bliss letter of April 2nd, 1910, to the Bureau, which I am willing should go in evidence. There seems to be one more letter which I have not here.

Mr. Coles: We will let you put the letter in and ask you to produce the other letter.

Mr. Fraser: We will make a search for the letter of March 29th, 1910.

The report is marked Exhibit 150.

The letter of April 2nd is marked Exhibit 151.

By Mr. Fraser:

Q. Now, Mr. Leavitt, in reference to the part of Exhibit 150, referring to a sketch, what is your recollection as to that. I refer to the part saying:

"Mr. Leavitt replied that he would, and later presented to the Board a sketch for its consideration. This sketch was considered with Mr. Leavitt," etc.

A. What I did was to make a free hand sketch showing the idea that I had of overcoming the difficulties that they had brought up.

Q. Did that sketch embody any suggestions made by any members of the Board, or any other naval officer?

A. It did not.

Q. What afterwards was done in regard to that design of depth engine?

A. Working drawings were made in accordance with my sketch, and engines were built from those drawings and installed on the torpedoes.

Q. Was the sketch preserved?

A. I doubt it.

Q. Was the construction of depth engine at that time designed the same as that now in the torpedo, or was it different?

A. It was practically the same.

Q. As the internal construction of that engine cannot be
404 seen in Exhibit 27, I ask you if you will produce a drawing, illustrating it.

Witness produces drawing.

A. This drawing represents the construction as I sketched it out.

The drawing is offered as Exhibit 152.

Mr. Coles: Objected to as immaterial and on the further ground that the sketch itself does not show any earlier date of design than that borne upon the sketch, which is February 3rd, 1913.

Mr. Fraser: The sketch is not offered as proof of any date; but simply to show the construction.

It is received.

Complainant excepts.

It is marked Exhibit 152.

Q. Please look at the drawing just offered in evidence and explain briefly the construction, and state how that overcame the objection that the naval officials had made to the previous design of engine.

A. The construction, as originally made, had two cavities in the

piston, one of which took air in, and the other was the exhaust where the air went out. The defect which they called our attention to was that if the pistons got a little leaky from wear, the high pressure air would leak into one end of the piston; whereas only the exhaust air could leak into the opposite end. In order to eliminate this and balance the pressure I simply put a groove in the piston which was connected with the exhaust, so that any leakage of air from the high pressure would go into the exhaust, and not leak into end of the cylinder.

405 The Court: If you are producing a drawing here to illustrate the mechanism it certainly ought to be complete. If you want to do anything to it, you had better add it now.

Q. Please point out on this drawing the parts last referred to, which embody the new construction, and mark them with letters.

Witness marks A, B and C.

A. Any air which leaked from the high pressure chamber "C" would pass into the annular space "A" and out through the opposite passage "BW" into exhaust chamber "D".

Q. The correspondence in evidence and the reports refer to a modified design and a new design. Which of those is the one illustrated in this last drawing?

A. This is what is called the new design (indicating).

Q. What was the modified design, so-called?

A. The modified design was simply reducing the lap on the valve by a very trifling amount, with the idea of accomplishing practically the same purpose. It was only what might be called a make-shift; but that has been called the modified design.

Q. That modification then was made in the earlier engine that they found fault with?

A. It was.

Q. I show you a letter from the Chief of the Bureau of Ordnance to the Bliss Company, dated April 4th, 1910, and ask you if you identify that as having been received by the Bliss Company?

A. Yes, I recognize that.

Mr. Fraser: I offer it in evidence as Exhibit 153.

It is so marked.

406 Q. I show you another letter from the Chief of the Bureau of Ordnance to the Bliss Company dated April 6th, 1910, and ask you if you identify that as having been received by the defendant?

A. Yes, sir, I can identify that.

Mr. Fraser: I offer it in evidence as Exhibit 154.

It is so marked.

Mr. Coles: Complainant's Counsel notes that it is with reference to this letter that Defendant's Counsel was requested to produce the letter of March 29th, 1910, from the Bliss Company to the Bureau, to which this Exhibit now offered is the reply.

Mr. Fraser: That letter is missing from the letters on this sub-

ject in the possession of the Defendant's Counsel and probably is not in the Bliss Company's files. I refer, of course, to the manifold copy of the letter. The original letter must be in the Bureau of Ordnance, where it is accessible to the Complainant, however, we will make another search for it.

Q. Do you know what is the so-called new design of depth engine that is referred to in the last two letters shown you?

A. It is the design that I have just described.

Q. Now, with reference to the curved fire gyro; I show you Exhibit 142 for identification, being your own patent No. 741683, dated October 20th, 1903, and ask you whether that patent contains any description of the curved fire or angle fire gyro for torpedoes; if so, please explain the system that is set forth in that patent, stating where you find it set forth.

407 Objected to as immaterial.

Same ruling and exception.

A. It does show a wide-angled fire device; figure 3 shows it very clearly——

By the Court:

Q. How many pages are there in the specification?

A. There — quite a number.

Exhibit 142 for Identification is received in evidence as Exhibit 142.

Q. This patent shows that the application was filed Feb. 9, 1899; at that time had you received any suggestions or information from the Bureau of Ordnance in the way of curved fire or angle fire for gyros?

A. I had not.

Q. When the contract of 1905 was made, the specifications for which called for a curved fire gyro, did the Bureau submit any designs showing the kind of curved fire gyro they wanted?

A. They did not.

Q. By whom was the gyro designed so as to give it the curved fire mode of operation?

A. By myself.

Q. Has the gyro been changed since then with respect to the curved fire feature?

A. No, it has not.

Q. As to any details of construction in any way changing the operation under curved fire has there been any changes made?

A. There have been changes made in the details of construction, yes.

Q. Have those changes been made at the suggestion of the Bureau?

A. No, they have not.

Q. By whom have they been made?

A. By myself.

Q. This same patent last referred to shows a gyro spun by compressed air, does it not?

A. It does.

408 Q. With respect to the spinning of the gyro by compressed air, have you had any suggestions from the Bureau of Ordnance or from any Naval Officer which have been adopted in the torpedo, as at present constructed?

A. I have not.

Q. The present construction of gyro with respect to the manner of spinning it was designed by whom?

A. By myself.

Q. Without any assistance from the Bureau of Ordnance or other naval officers?

A. Without any assistance from anybody.

Mr. Fraser: To the feature of the superheater that was discussed I wish at this point to offer in evidence the British Patent of Johann Gesztesy No. 18241 of 1908.

The patent is marked 155.

Cross-examination by Counsel for Complainant.

By Mr. Coles:

Q. Isn't it a fact that when the Gesztesy superheater structure was being discussed between you and the Bureau Officers that you interposed objections to the adoption of the principles of construction illustrated by Gesztesy?

A. I don't remember that I did; I think I might have done so, though; I think it was open to such objection.

Q. You only yielded to the Bureau's suggestion in that respect finally, didn't you?

A. Yielded to what?

Q. In carrying on the experiments which led to the development of that type of super-heater you were induced to adopt it because you saw that the Bureau insisted upon it, were you not?

409 A. No, we were not; that wasn't the object at all.

Q. You do remember that the Bureau insisted upon its adoption, don't you?

A. I don't remember anything of the kind; in fact I don't think that the Bureau did insist on it.

Q. Didn't the Bureau insist upon its consideration in connection with the solution of the super-heater problem?

A. It depends on what your definition of the word "insists" is; according to my definition of the word there was no insistence at all.

Q. Was it what you would call a suggestion?

A. Nothing more, as I can remember, than the fact of their presenting that blue print.

Q. What blue print?

A. Well, I forget—the patent that we were just looking at; I can't get that man's name.

Q. Isn't it a fact that the Bureau paid the Bliss Company for experiments with the use of water in a super-heater, and that the

Bureau insisted upon increasing the range by using such super-heater?

A. I don't think they ever paid us anything; I am sure they have always insisted upon getting the best we could produce, or always a little beyond what we could produce, in fact.

Q. Don't you recall that with the type 21 and the type 18-inch torpedoes, when they first used water in a super-heater, that your company was paid additional on account of the experiments in connection with using this water super-heater?

Objected to as immaterial; it is a matter of contract.

The Court: Well, go on.

Exception.

A. A contract was entered into for two torpedoes in which a minimum performance was specified, and a bonus was paid us for
410 every increase in range that we got over that minimum.

Q. Do you know why that bonus was put in the contract?

A. To get out of it all that was capable for us to give them.

Q. It was for the purpose of inducing by co-operation the development of the best torpedo, wasn't it?

A. You can put it in that way; it was to spur us up to producing the best thing that we could produce.

Q. And they co-operated with you to the extent of allowing you a bonus for that effort?

A. They certainly paid us for what we got over their minimum requirements.

Q. Do you claim that you originated the independent spin principle as applied to the torpedo, the independent air spin?

A. As far as I know.

Q. Isn't it a fact that the Bureau suggested the importance of the use of the air spun gyro?

A. I don't remember that they did; it is possible they may have done so; certainly they had no reason to suggest it when we were already doing it.

Q. But as a matter of fact were you already doing it before it was suggested that the Bureau desired to have it done?

A. Why, certainly; the first torpedo we ever issued to them had the air spin.

Q. But not in the form in which it is embodied in the Mark 7 torpedo?

A. Practically the same form, yes.

Q. Didn't the first form of torpedo which you have just spoken of having modified have buckets on the rim of the gyro?

A. It certainly had buckets on the rim of the gyro wheel.

Q. That is not the case of the feature embodied in the Mark 7 torpedo?

A. No, it is not.

Q. How is this Mark 7 feature constructed?

411 A. It has an independent turbine which spins the wheel; instead of having the buckets directly on the rim of the wheel itself.

Q. That is then, quite different from the original type in the first torpedo you referred to?

A. It is different in that respect; in so far as the fact of its being spun with air it is the same; that is what I meant to say.

Q. Well, only in that respect is it the same? That is the distinctive point?

A. That is the practical difference between the two.

Q. You don't claim to have originated the use of the curved fire and wide angle fire, do you, in connection with torpedoes?

A. I think I was one of the first to do it; they may have done it abroad; but I am not sure of that.

Q. How about its being done at the Torpedo Station prior to its ever having been done by you?

A. What they did prior to 1900, of course, I don't know; I did it before 1900.

Q. How long before 1900?

A. About two years.

Q. Are you positive?

A. Absolutely.

Q. What was the month and year?

A. The torpedo was designed with the wide angle fire in 1898.

Q. What month?

A. It ran over several months; I can't say what month.

Q. You couldn't fix the month in the year 1898 when it was first used by you, could you?

A. From the time it was started until we had the torpedo built, and tested, was probably two years; of course I can't locate within a month.

Q. The first torpedo was built and tested with it, so far as your application of it was concerned, in 1900, was it?

A. I think it was tested in 1899; it was built in 1898.

Q. The first torpedo that you submitted to the Bureau from the Mark 3 18-inch type didn't embody this curved fire or wide
412 angle fire, did it?

A. No, I left that out.

Q. Isn't it a fact that you have been consistently opposed to the use of wide angle fire for reasons which appeal to you mechanically?

A. I can't say that I am opposed to it if the Navy wants it; my judgment has always been against its use.

Q. And the naval officers have insisted upon its use?

A. The naval officers have insisted upon its use.

Q. And you finally yielded to their insistence in that respect?

A. No, I didn't yield to their insistence; I never raised any objection to their putting it in if they wanted it; but I advised against it.

Q. You were naturally opposed to it, but they insisted upon it so you let them have their way about it?

A. I wasn't opposed to it in the sense that I didn't want to furnish it if they wanted it; I wasn't opposed to it.

Q. Well, I mean to say that you didn't think particularly well of it, but as long as they insisted on it you let them have it?

A. Yes, that is the idea exactly.

Q. With reference to depth engines you were shown a red book, not a public document, but a Navy Department pamphlet, and you pointed out a plate, plate 13-A, as illustrating the depth engine; do you know who built the engine of the type which you pointed out, and when?

A. I don't remember; I didn't notice.

Q. It wasn't the Bliss Company, was it?

A. As I told you I don't remember the details of the drawing sufficiently to say that without looking it up more.

Q. Well, look at it again.

A. I showed that as showing the general design of the engine which the Whitehead people used at that time. Now whether
413 this particular one is that, I couldn't say now.

Q. Wasn't the type of depth engine which you have indicated as Plate 13-A embodied in a short range low powered torpedo by the Whitehead Company?

A. Yes, it was short range and low power compared with what we are doing now.

Q. Isn't it a fact that that Whitehead Company changed from its type of depth engine after the power and range of torpedo was increased?

A. I think they have changed, yes.

Q. Did the Bliss Company do the same thing in reference to changes?

A. We made the changes which I have described on direct examination.

Q. But you didn't make it at that time, didn't you?

A. At what time?

Q. You didn't make it until after the meeting of the Board?

A. No, not until after the meeting of the Board.

Q. Isn't it a fact that at that Board meeting, and when you were present, and conversations were being had between the naval officers on that Board and yourself, that the officers complained of the performance of the then existing type of depth engine?

A. They complained then and they had complained before that.

Q. And they urged upon you the importance of changes in the depth engine so as to get better results, didn't they?

A. They did.

Q. Isn't it a fact that while that Board was in session and these conversations were going on between the officers and yourself that their commander Bristol showed you a plate or sketch of the Whitehead depth engine which you stated at that time you had not seen, and did not Commander Bristol and Lieutenant Commander McCreary explain that to you, and discuss it with you?

A. Yes, but I didn't like the design and turned it down.

414 Q. You stated on your direct examination that after these naval officers had urged that changes be made in the depth engine and had suggested to you to see what you could do along that line, that the next morning you came back with a sketch, and you said that sketch had not been preserved?

A. As I remember it was the same day; my memory was that I just made a sketch then and there.

Q. That amendment by you will be accepted. If that sketch which you took back to the officers did not embody any suggestions as to relieving difficulties which had been mentioned by them to you, how can you say that it met the difficulties which they had complained of?

A. That is rather deep for me.

Q. Well, that question embodies two of your answers on direct examination, as I understood them.

A. Put it a little clearer to me.

Q. You stated, as I recall, that the sketch which you took back to them did not embody any suggestions which you had received from any officers?

A. That is correct.

Q. And yet you also stated that the sketch which you then presented was substantially that shown in Exhibit 152, and which you said was the new design. My question is, if you did not receive any suggestions from the naval officers as to overcoming the difficulties which they complained of, how can you say that the sketch which you took them, that day or the next day, did meet the difficulties which they complained of?

A. They suggested what they considered defects, and put it up to me to find some way of overcoming that.

Q. Was not the sketch which you submitted while the board was still in session the direct result of this discussion, and explanation, on the part of the officers?

415 A. It was the direct result of their prodding me up to give them something better than they had, yes.

Q. And they had told you particulars in which what you had already given them was unsatisfactory?

A. Certainly.

Q. They had pointed them out to you?

A. Certainly; they pointed out the fact that the leakage of the air affected the run; after the engines had been in use for awhile.

Q. Now you referred to this Exhibit 152 as the new design of depth engines, as you understood that term to be used in the correspondence to which your attention was called?

A. Yes.

Q. You cannot state positively that this Exhibit 152 is identical in all respects to the sketch which you took to the naval officers while the Board was in session, can you?

A. As near as a finished drawing can be like a free hand sketch.

Q. That is as near as you can come to it. You said that between the old design which was the subject of a complaint by the naval officers, and this new design as you have designated Exhibit 152, there was an intermediate make-shift, or another design?

A. Yes.

Q. Isn't it a fact that that intermediate design was more like your first sketch that you submitted to the Board while in session than this Exhibit 152?

A. Absolutely not.

Q. The intermediate design though between your first sketch and this Exhibit 152 was a design which you had also furnished to meet objections that had been made by officers, wasn't it?

A. That could hardly be designated as constituting a design; it was the same engine exactly with probably two or three thousandths taken off the lap of the valve; so that can hardly be considered as another design.

416 Q. But as matter of fact after the complaint was made by the naval officers while that board was in session the matter was fully discussed, and you were asked to see if you couldn't correct the trouble, the first attempt of the Bliss Company in correcting that trouble still proved unsatisfactory to the Bureau, and the Bureau again urged that a better design be produced, and that as a result of that the present design, Exhibit 152, was evolved; isn't that so?

A. No, that is altogether wrong.

Q. State wherein that is wrong?

A. It is wrong from the fact that the so-called modified design was one which we had used in the torpedoes before the Board met.

Q. I call your attention now to that correspondence which refers to a design as being unsatisfactory, which appears to be an intermediate design between the Board report and the design Exhibit 152; is that correct?

A. It is intermediate in the sense that that so-called design was a make-shift adopted sometime before the Board met. We had taken a little off the lap of the valves and found that it did improve the operation of the torpedo. Now when the Board met they considered that as only a make-shift and wouldn't have it; it was then that I presented them with this new design.

Q. Then the Board had been repeatedly complaining against the performance of the other design which you had furnished, and after being again urged by the Board and by correspondence you got up this present design?

A. No, that is not correct. The Board hadn't previously made any objection to it. They hadn't assembled, this was all done before the Board assembled.

Q. The Bureau had previously objected, before the Board assembled, to the performance of the then existing depth engine?
417

A. Yes, the Inspector at our works had.

Q. Then when the Board met they pointed out the objections to this performance, and requested you to try to improve it and as a result of that action by the Board and also the continued request of the Bureau for a better product the present type was evolved; is that correct?

A. No, that isn't correct; it wasn't any continued request. It was simply that then and there the Board found fault with the apparatus that we had put in the torpedo and requested us to change it; which I did then and there; it was not a continuing process.

Q. There was difficulty experienced by your company in passing

the acceptance tests on the Mark 4 torpedo, which had the original type of depth engine?

A. Well, the depth engine was the least of our troubles on that torpedo.

Q. You did have trouble getting that torpedo passed?

A. Oh, yes, we had a great deal of trouble; we had to rebuild it.

Q. And the depth engine which was in that type of torpedo was the original type, and not the type which was evolved after the criticism by the Bureau and by the Board?

A. I don't remember exactly about the Mark 4; that was a torpedo that was rebuilt in every way; it was practically rebuilt and made new.

Q. It is true, however, that the present type of depth engine has been an evolution due to the criticism of the Bureau and of the Board with respect to the former type of depth engine?

A. Evolution represents a slow process of growth, as I understand the term; this wasn't a slow process; it was changed then and there.

Q. Well, it is the result of such criticism?

A. Yes, it is the result of such criticism.

418 Q. With reference to the starting of torpedoes; you said something about a change being made to the starting lever or hook by you; was not this change made to meet the requests of the Bureau?

A. I think it was; they found fault with our breaking tube arrangement, and wanted something different.

Redirect examination by counsel for the defendant.

By Mr. Fraser:

Q. Please explain why it was against your judgment to use the curved fire or angle fire gyro in torpedoes?

A. Because I believed it was a menace to the ship that fired the torpedo.

Q. For what reason?

A. For the reason, owing to technical matters which I hardly think it necessary to go into, there is a chance for the torpedo to continue on the circular course that it has on starting out, and coming around and striking the ship; I believe that there is a danger of that kind which is inherent in the system.

The Court: What is technically known as a boomerang?

The Witness: Yes, sir.

Recross-examination by counsel for complainant.

By Mr. Coles:

Q. Your view on that subject was so strong that it naturally led you to make counter suggestions as to the adoption of that type of fire, wasn't it?

A. It was so strong that I didn't think it advisable to adopt it in the torpedo which we built to present to the Navy Department.

Mr. Fraser: If the Court please, I wish to offer two more patents

as cumulative evidence concerning counter-revolution turbines geared together, to work at equal speeds.

These are patent to J. F. Brady, No. 643,938, dated February 20, 1900, which I offer as Exhibit 156; and patent to H. H. Boyce, No. 693,946, dated February 25, 1902, which I offer as Exhibit 157.

Mr. Coles: Complainant's counsel objects to the introduction of these exhibits as irrelevant and immaterial to any issue involved here.

The Court: They may be marked.

Exception.

They are marked respectively, as 156 and 157.

Mr. Platt: Mr. Page was asked to produce letters from the files of the Bliss Company relating to the visit of Mr. Yamashita on December 11, 1906, and here are two letters which are all there are on the subject. We will offer these letters in evidence.

The letter of December 3, 1906, is marked Exhibit 158.

The letter of December 3, 1906, is marked Exhibit 159.

Defendant rests.

Mr. Coles: I wish to offer letter of January 25, 1913, from the Bureau to the Bliss Company, page 60, of Folio F, and ask to have it marked Exhibit 7½. This was inadvertently omitted in offering our exhibits.

The paper referred to is marked as requested, Exhibit 7½.

420

Testimony in Rebuttal.

GEORGE W. WILLIAMS, recalled in rebuttal, for the Government.

By Mr. Coles:

Q. You have stated that you were on duty in the Bureau of Ordnance from May, 1906, till June, 1908. State briefly what previous and subsequent duty and experience in connection with torpedo work you had had?

A. I gained some slight acquaintance with torpedo work as Executive Officer of the torpedo boat Cushing from August, 1894, to April, 1895; I followed a course of instruction at the torpedo station of six weeks in the summer of 1899, and was on duty at the Naval Torpedo Station in charge of the torpedo boat, with additional torpedo experimental duty from May, 1901, to September, 1902; commanded the torpedo boat Destroyer Bainbridge and acted as torpedo officer to that vessel from February, 1903, to July, 1904; commanded the Asiatic Torpedo Flotilla from July, 1904, to April, 1905; was on duty at the Torpedo desk in the Bureau of Ordnance from May, 1906, to June, 1908; commanded the Atlantic Torpedo Fleet from January 1st, 1910, to March, 1911; was Inspector of Ordnance in charge of the Naval Torpedo Station from March 11th to date.

Q. During your duty in the Bureau of Ordnance what torpedo contracts with the Government was the Bliss Company working under, and what type of torpedoes did these contracts refer to?

A. They were working under three contracts for torpedoes; one for 50 5-meter by 45-centimeter Mark 3 torpedoes; one for 50 5-meter by 45-centimeter Mark 4 torpedoes; and one for 300 5-meter by 21 inch torpedoes, known as Mark 1, but the marks were afterwards changed with the changes in the torpedoes.

421 Q. Describe briefly the history of the 50 torpedoes, Mark 3, delivered under the contract of January 11, 1904?

A. When I reported for duty in the Bureau of Ordnance a certain number of these torpedoes, about one-half, I believe, had been accepted; a great deal of difficulty, however, was encountered during the years 1906 and 1907 in passing these torpedoes on the range; I think that the final torpedo was passed in the summer or fall of 1907.

Q. The final torpedo under the January 11, 1904, contract was passed in the fall of 1907, was it?

A. That was the Mark 3. I don't remember the dates of the contracts; my idea was that the Mark 4 torpedoes were the 1904 contract.

Q. State briefly as to the 50 torpedoes, Mark 4, of the contract of March the 29th, 1904, as to when they were delivered and what you may recall with reference to difficulties in their delivery?

A. This contract was still pending when I left the Bureau in June, 1908. Information gained subsequently was to the effect that the contract was finally completed in 1909. In the meanwhile there had practically been rebuilt at least one, being fitted with a balanced turbine and outside superheater.

Q. Do you know what became of the 50 Mark 3 torpedoes which you were asked about a while ago?

A. They were delivered at the Torpedo Station; a few of them were issued to service. On the first target practice of the Destroyer on the Pacific Coast one of them blew up just after being fired, and we withdrew all of them from service and stored them at the Torpedo Station. They are now in process of being converted into modifications of the Mark 7 type and fitted with balanced turbines and outside superheater, and a new form of gyro.

422 Q. Are those 50 torpedoes the ones referred to in the report which was read into the record by Mr. Fraser?

A. I can't say as to that; I don't remember the details.

Q. I refer you to Folio B, pages 18 to 37. Defendant's Exhibit 133. Please answer the question in view of this report.

Mr. Fraser: Objected to, because the report now referred to is a report concerning the first experimental torpedo that was offered; not a report as to any torpedoes that were in course of construction.

The Court: I will hear the testimony about it.

Exception.

A. This report refers to a torpedo apparently of the same general type as Mark 3 18-inch torpedo.

Q. What became of the 50 Mark 3 18-inch torpedoes first delivered by the Bliss Company to the Navy Department?

A. I think I have answered that question.

Q. State briefly what you recall with reference to the 300 torpe-

does, Mark 1, 21-inch, which were the subject of the contract of November 22, 1905?

A. 50 of these torpedoes were accepted by the Government after trials from 1906 to 1907, practically in their original design, and known as Mark 1. These torpedoes were fitted with an unbalanced turbine and the inside superheater. They were issued to service, and afterwards withdrawn and are about to be converted into modifications of the Mark 3, 21-inch, torpedo at the Naval Torpedo Station, being fitted with balanced turbines, inside superheaters, and the torpedo station design of gyro. Ten of these torpedoes were taken over by the Government before having passed their acceptance trials; the other 40 were taken under reduced specifications at a reduced price. The first 10 were used for experimental purposes to a large extent, and I think two of them were practically destroyed during experiments.

Q. How about the other 250 under that contract?

A. The 250 remaining torpedoes were altered by the E. W. Bliss Company, being fitted with balanced turbines and outside superheaters, and were given the designation Mark 2; those which have not been lost are either in store at the Torpedo Station or are now in service. They are about to be fitted with new steering engines.

Q. Why are they about to be fitted with new steering engines?

A. The steering engines with which they are now fitted, the original design, proved itself inferior, being unreliable, inferior to a later type.

Q. What design of steering engine did they originally have; what you term the original design?

A. I think it was known as type A.

Q. Wasn't it a Bliss-Leavitt design?

A. It was a Bliss-Leavitt design. It was the one with which great trouble was experienced in service. It was changed in the case of the Mark 3 torpedo.

Q. Is that the change that was discussed by Mr. Leavitt in the testimony this afternoon, which is referred to in the report of the Torpedo Board, Exhibit 150?

A. I so understand.

Q. Have you had any experience with the 21-inch so-called Mark 3 torpedoes manufactured and delivered under the contract of 1909?

A. I have seen them fired at the Torpedo Station, and have examined the mechanism.

Q. From your experience state what is your knowledge as to the reliability and performance of this type of torpedo?

A. It is the most reliable Bliss-Leavitt torpedo yet built; it is almost as reliable as the Whitehead.

424 Q. What have you to say as to whether these torpedoes you have just referred to in connection with the 1909 contract were of increased efficiency as the result of experiments and deficiencies disclosed in the operation of the previous types, such as those under the 1905 contract and prior contracts?

A. I think so; the most marked improvement in the Mark 3 is in

its depth performance; the most marked single improvement; but the torpedo on the whole is better constructed than Mark 2.

Q. The improvement in the depth performance is due to the adoption of the new type of depth engine, is it?

A. Partly, I think; to a large extent.

Q. Is that same type embodied in Exhibit 27?

A. Yes.

Q. Mr. Page and Mr. Leavitt stated in substance that no torpedoes had been built by the Bliss Company for the Government which embodied the design of a balanced turbine, disclosed in blue print 117-E, Exhibit 28. What have you to say as to this matter, and give your reasons for your answer?

A. I have always considered the turbines fitted in the Mark 2 21-inch, Mark 3 21-inch and Mark 4 18-inch and Mark 6 18-inch and Mark 7 18-inch were balanced turbines of the design shown on that blue print.

Q. Does Exhibit 27 embody the balanced turbine of the design 117-E, blue print Exhibit 28?

A. According to my understanding of that blue print, yes.

Q. Does Exhibit 27 embody the balanced turbine illustrated in the Davison patent?

Mr. Fraser: Objected to as calling for a conclusion, without calling for any reasons.

425 The Court: I think I will let you cross-examine the witness.

Exception.

A. I think the Davison patent would cover that turbine, Exhibit 27.

Q. Mr. Leavitt said that he had observed a sheer in the test of a torpedo having a balanced turbine. Have you ever conducted any investigation on that subject, and give the results thereof?

A. Yes; in the trials of the Mark 3 18-inch torpedoes, as modified by the balanced turbine, we found sheer to exist. The subject was investigated and we found that these torpedoes ran with a heavy list to port; these were fitted with unbalanced turbines. The cause thereof then became obvious. In order to compensate for the natural heel to starboard, when fitted with the unbalanced turbines, they had been fitted with unbalanced propellers. They were brought to an upright position by cutting off one of the propellers. Sheer is caused by heel; heel may be caused by a number of things.

Q. State what is the approximate amount of money paid and to be paid under past and pending contracts between the Government and the Bliss Company for the so-called Bliss-Leavitt torpedoes?

Objected to. Sustained.

Exception.

Q. If penalties for lack of performance in accordance with the requirements of the specifications had been assessed against the

Bliss Company by the Government what would be the approximate amount of such penalties under these contracts?

426 Objected to as irrelevant and immaterial and incompetent.
 Objection sustained.
 Exception.

Q. Mr. Leavitt said, in speaking of the unbalanced turbine, Exhibit 146, that the weight of the torpedo was so great as compared to the mass of the turbine wheel that there would be no reaction on the torpedo. What have you to say about this contention of Mr. Leavitt's?

A. I do not think that the relative masses would be the sole criterion; a torpedo has a moment of inertia many thousand times greater than the turbine wheel around that axis; but the turbine wheel is moving about 400 feet a second; and the energies stored up of any mass moving at that speed is considerable; it is only a question of how long the torpedo is subjected to that force. It will turn if it is subjected at all. In order to prevent that torpedo deflecting to a greater or less extent from the line of aim it will be absolutely necessary to unlock the gyro before the torpedo leaves the tube. If the gyro is locked while the torpedo is in the air the torpedo will be deflected to an amount depending upon the time which it is subjected to that force. In case the gyro is unlocked before the torpedo leaves the tube the torpedo will still be deflected by the gyro, and will bring it back to a line parallel to the line of fire.

Q. About the time when the gyro is unlocked, what have you to say as to the degree of success that the Bliss Company has attained in embodying such a gyro in the torpedo?

A. I understand that the Bliss-Leavitt gyros now unlock at about half a second; we found this possible at the Torpedo Station. I believe it was promised that the new ones would unlock in a quarter of a second; half a second is too long. In the case of a submerged
427 discharge the torpedo will be out of the tube in that time for
 above-water discharge.

Q. And if the gyro mechanism doesn't unlock in less time than half a second it will not be unlocked before the torpedo leaves the tube?

A. That of course depends upon the impulse. It is possible to get a torpedo out of the tube in less than half a second; but in practice they rarely get out.

Q. What has been your observation as to practice with respect to whether the gyro did unlock before the torpedo left the tube, or after?

A. Half a second seems to be about the critical time for submerged discharge.

Q. Mr. Leavitt stated in effect that there was practically not a single instance of any assistance received by the Bliss Company from the naval officers which had been embodied in the development of the existing torpedo. Will you tell the Court what assistance the Government has rendered the defendant in developing the present type of torpedo?

A. In 1906 the attitude of the Bureau toward the Bliss Company was one of co-ordination; we desired to make use, to as great a degree as possible, of Mr. Leavitt's well-known ability as a designer. There were conditions, however, which Mr. Leavitt could not know to the same degree as they were known by the naval authorities. Those were service conditions which were essentially different from those obtaining at the testing station at Sag Harbor. The Bureau did not wish to deprive Mr. Leavitt or the Bliss Company of the slightest freedom of action. They therefore adopted a policy of constructive criticism, and furnished the Bliss Company with the reports of the behavior of the torpedoes under simulated service conditions, which could be obtained at the Torpedo Station. Mr. Leavitt has graphically described his state at this time, and the Bureau itself was suffering considerable embarrassment because of the shortage of torpedoes in the service: the insistent demands from the Navy Department and from the service for torpedoes. The state of affairs as regards the passing of torpedoes in the summer of 1906 was desperate. In fact, if I remember correctly, Mr. Leavitt practically had his hands up in the air. The Bureau undertook an investigation of the torpedoes Mark 3 type, and arrived at the conclusion that a balanced turbine would remedy some of the defects; some of the deficiencies of the performances. This conclusion was arrived at, or at least, the results of the conclusion were achieved somewhat late in the year 1906, and the winter season having closed in the north, on account of the urgency in the matter, the Bureau obtained authority from the Navy Department to send a testing expedition to Key West. That expedition consisted of a 900-ton torpedo vessel, a torpedo boat, with probably about 50 men and 3 or 4 officers. In order to provide material for testing the Bureau took over a number of 21-inch torpedoes having, in addition, the Mark 3 torpedoes. I think we took over 5 Mark 4 before they passed their acceptance trials. The Bliss Company were invited to have representatives at Key West, and the trials were carried on for several months during the winter. Mr. Leavitt was there for a considerable period. Such information as was obtained from those trials was freely given. This action of the Bureau was not for the purpose of helping the Bliss Company primarily; the ultimate purpose of it was to get torpedoes. We have always considered that the balanced turbine was given to the Bliss Company. There have been frequent and free discussions of torpedoes and various ideas have been expressed by naval officers; but it has not been the general idea of the Bureau to make points, or even to take credit in specific instances. There has recently, however, been one specific instance in which the performance of the Bliss-Leavitt torpedo has been made more efficient through suggestions from the Torpedo Station; that is in the fitting of the diving mechanism of the Mark 6 torpedo with an attachment by which the old diving mechanism was locked for a certain period after discharge, instead of the pendulum simply being locked as in the original design. Very little originality can be claimed for this idea. It is simply the Whitehead practice. But a design suitable for use in the Bliss-Leavitt diving mechanism

was furnished to the Torpedo Station, and the idea had been incorporated in the Mark 7 torpedoes.

Q. Just make clear what you mean by diving mechanism?

A. I mean that the diving mechanism of the torpedo is that control mechanism in the torpedo which keeps the torpedo a certain depth.

Q. Does it relate to what has been called the depth engine mechanism?

A. The depth engine is a part of the depth mechanism; the part I was speaking of was exterior to the depth engine, but exercises control over the depth engine through a certain period.

Mr. Platt: I think if the Court please that that ought to be stricken out. The complaint talks about a depth engine, and now they are talking about a diving mechanism.

The Witness: They are inter-connected. They are all parts of one control mechanism.

430 By the Court:

Q. But you wouldn't refer to that as the depth engine?

A. The depth engine, as I understand it, referred to today in Mr. Leavitt's testimony, consisted simply of the cylinder with a piston and valve working inside of it.

By the Court:

Q. Do you say that any design for this device was supplied by the Government?

A. Yes, sir.

Q. Under notice?

A. I can't testify as to that, because I simply sent the blue print to the Bureau.

The Court: Well, go on.

Exception.

Q. What have you to say with reference to giving the Bliss Company assistance by advising them of the results of tests at Washington, at the Washington Navy Yard relating to resistances of torpedoes?

Mr. Fraser: Objected to as not stating clearly which of these causes of action it goes to; and furthermore, as not rebuttal.

The Court: He may answer and then we will see.

Exception.

A. When the question of increasing the diameter of the torpedoes from 18 inch to 21 inch first arose, with that arose the question of increasing resistances. The matter was, according to the record of the Bureau of Ordnance, submitted to Naval Constructor Taylor of the Washington Navy Yard, who conducted certain towing experiments and arrived at certain conclusions. This information I have always understood was given to the Bliss Company. It occurred before my tour of duty in the Bureau.

431 Mr. Fraser: I move to strike out the answer as incompetent.

Motion granted.

Exception.

Q. Will you continue your answer to the previous question as to Mr. Leavitt's claim, and state what you know with respect to assistance furnished the defendant in connection with superheaters?

A. As I recall, no specific official information, or formal information was furnished Mr. Leavitt in regard to superheaters, except in regard to a water superheater which was forwarded to the Bliss Company I think in 1907, while I was with the Bureau of Ordnance. We were on the point of giving them certain information; but the Armstrongs did it first.

By the Court:

Q. Who is Armstrong?

A. Armstrong is the general name of the firm under which the outside superheater was developed; they are the English firm; the name is Sir William Armstrong.

By Mr. Coles:

Q. Now as to the experiments at the Torpedo Station in 1911?

A. In 1911 we conducted certain experiments, or at least tests of the Mark 6 18-inch Bliss-Leavitt torpedo. These torpedoes had been tested at Sag Harbor under the conditions obtaining on the range, being fired from an above water tube; they were, however, intended for use in submarines, and in order to determine their availability for use in submarines they were put through a series of tests at Newport, using the Octopus as a testing vessel. There was a representative of the Bliss Company present for a considerable period. We seemed satisfied at the end of the tests that the
432 torpedoes could perform sufficiently for service so we issued them for service. We tried getting ready for target practice, but depth troubles developed, and we withdrew them and issued Whiteheads. The Torpedo Station took up the question of the depth and made two changes in the torpedoes with fairly successful results: the installation of a positive locking gear, before referred to, and the slowing down of the torpedo; the present depth mechanism being apparently unable to control the torpedo at its full speed with accuracy.

Mr. Fraser: I ask that the answer be stricken out on the ground that these developments, as testified to by the witness, were not brought home to the Bliss Company.

The Witness: This information had been given to representatives of the Bliss Company formally, in a letter in regard to the positive locking gear, and informally in discussions.

Mr. Fraser: I object to that, because it is secondary evidence; the letter should be produced, if it is material to the case.

By the Court:

Q. Do you refer to a letter that is in evidence?

A. No, sir.

The Court: Strike it out.
Exception.

Cross-examination by counsel for complainant.

By Mr. Fraser:

Q. When you said that the balanced turbine was the same in the 250 21-inch Mark 3 torpedoes under the 1905 contract and in the Mark 4 torpedo, and another one that you named, and in the Exhibit 28, blue print, and in the Davison patent, and in the 433 existing Mark 7 torpedo, did you mean anything more than that in all of these there are two turbine wheels turning in contrary directions?

A. I meant that as a general idea of the construction, yes; there are differences in them all; in details.

Q. So far as your testimony that they all contain the balanced turbines is concerned, you meant to limit it then to that one feature, did you?

A. Yes.

Q. When you said that the velocity of the revolving turbine with respect to its effect upon the mass of the whole torpedo was to be taken into consideration, and expressed the opinion that the torpedo would yield to the effect of the mass and velocity of the turbine, if unbalanced, did you base that upon any experiments, or is it simply your judgment?

A. No; I based it on a consideration of the forces existing in torpedoes.

Q. Then it is simply your opinion, is it?

A. My opinion is based on some mathematical study of the moments of inertia. It is merely a mathematical problem. It is no opinion; you can work it out yourself.

Q. That is, theoretically you can work out on paper that the torpedoes should yield to that force?

A. Yes, you can work it out.

Q. And you offer that without any experimental demonstration as against Mr. Leavitt's testimony that he actually experimented with the thing and found no perceptible yielding, do you?

A. The force is there; it is a fact in nature; the force is there. It must produce some effect.

Q. We all admit that there is a tendency?

A. That is my only statement.

Q. The only question is whether it is negligible or otherwise?

A. It depends entirely on the length of time it acts, and 434 what you consider negligible. If you consider one degree negligibility, if that is acting for one second, it will be inside of one degree.

Q. The fact is you made no experiment?

A. I made no experiment, and had never seen that torpedo before.

Redirect examination by counsel for complainant.

By Mr. Coles:

Q. Do you consider that 3 runs of this engine, which is Defendant's Exhibit 146, would be sufficient to determine that problem as to whether there would be any yield or not?

A. There are too many elements entering into the direction of a torpedo to base any positive conclusion on 3 runs.

Mr. Coles: We have obtained the papers that counsel for defendant requested on Friday, and I believe they do not care to put them in, and we do not care to offer them. So I merely notify them that we have them.

Complainant rests.

Defendant rests.

Testimony closed.

The Court: Two weeks from to-day file and exchange your briefs, and three weeks from to-day, or one week after the filing and exchange of briefs, you may come before me and make an oral argument.

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Opinion of Court.

United States District Court, Eastern District of New York.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

Memorandum. April 14, 1914.

William J. Youngs, United States Attorney; Malcolm A. Coles, Special Assistant to Attorney General, and Louis R. Bick, Assistant U. S. Attorney, for Complainant.

Arthur C. Fraser, Frank H. Platt and Robert H. Ewell, for defendant.

In this suit the complainant seeks to enjoin the defendant from communicating the complete construction and operation of the existing type of Bliss-Leavitt torpedo, so-called, and from making any demonstration thereof, to a representative of Messrs. Whitehead & Company, or to any other person or government. The complainant bases its claim to relief partly upon contract provisions, and, in the alternative, upon the provisions of the Act of Congress of March 3, 1911 (36 Stat. 1084, 1085), commonly called the National Defense Act.

It appears that the defendant has been making torpedoes for the use of the United States Navy since November 22, 1905. Pursuant to the terms of — various contracts between the parties, several lots of torpedoes have been delivered to the complainant, but there remain undelivered some of the torpedoes called for by a contract of June 12, 1912, as well as all those specified in contracts subsequent thereto.

The only contracts in evidence are those of November 22, 1905, and June 12, 1912, mentioned in the complaint, and one of the intervening contracts, dated June 16, 1909. In the 1905 contract there was the following provision, which it is admitted was embodied in all the subsequent contracts:

"Nineteenth. It is hereby expressly further stipulated, covenanted and agreed, that the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations or others, or for other governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to, or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the party of the first part will not exhibit the performance of any torpedo containing such device either in shop or in service tests, to any person or persons, firms, corporations or others, or to other governments, or their representatives, than the party of the second part hereto; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract.

"Provided furthermore, that no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when the said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

In the contract of June 12, 1912, the foregoing clause became clause Twentieth. The 1912 contract contained, however, in the second clause, the following new matter, which (save that part enclosed by brackets) had not been included in previous contracts:

"[Second. The manufacture of said torpedoes] (the word 'torpedoes' as used throughout this contract being intended to include

everything covered by the drawings, plans and specifications above referred to) [shall conform in all respects to and with said drawings, plans and specifications] including duly authorized changes therein, but said drawings, plans and specifications are not hereto annexed or made a part hereof. They contain information of a confidential character that cannot be made public without detriment to the government's and the contractor's interests, and they are to be treated as confidential by the parties of this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract."

Eventually the defendant, desiring to negotiate with Messrs. Whitehead & Company for the sake of the right to manufacture the Bliss-Leavitt torpedo in certain foreign countries, and being met by the opposition of the Bureau of Ordnance, communicated to the Secretary of the Navy, on May 9, 1913, its desire to submit the issue to judicial decision, adding:

"As a means to this end we notify you hereby that it is our intention to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and to make a demonstration of the operation of said torpedo, to a representative of Messrs. Whitehead & Company on or immediately after June 1, 1913."

Thereupon this suit was brought. Although the issue arose over the use of the so-called balanced turbine, the bill of complaint sets forth four devices the design for which is claimed to have been furnished by the complainant to the defendant in accordance with the restrictive terms (as quoted above) of the contracts: (1) the balanced turbine, (2) ball bearings in the gyroscope, (3) super-heater, and (4) compound air regulator. In addition to the foregoing devices, the complainant specifies four other principles, designs and devices, which, although not furnished by the complainant to the defendant in accordance with the terms of the 19th and 20th clauses of the contract, are nevertheless claimed to have been communicated or suggested to the defendant by the complainant, and the disclosure of

which, together with those already mentioned, is prohibited. it is contended, by the National Defense Act of March 3, 1911 (36 Stat. 1084, 1085); (a) changes in location and area of vertical rudders; (b) changes in method of starting torpedoes; (c) changes in type of depth engine, and (d) changes in curved fire gyro. All the foregoing devices and designs are alleged to be contained in the existing type of Bliss-Leavitt torpedo.

I construe the agreement between the parties to mean that the Bliss Company was free from the beginning to make and sell torpedoes to any other party or government, save as limited by the restrictive clause relating to devices the design for which had been furnished by the Government; that is to say, the additional clause in the 1912 contract made explicit that which was implicit in the contract of 1905 and intervening contracts.

The Bliss Company agrees that "it will not make use of any device the design for which is furnished to it by the party of the second

part in any torpedo constructed or to be constructed for any person or persons, firms, corporations or others, or for other governments." The defendant contends that the word "furnished" must be construed to mean the furnishing of devices which were unknown not only to the defendant but in the prior art as well; in other words, such devices only as were patentable at the time the design was furnished. I am unable to assent to such a construction. It is warranted neither by the plain wording of the contract nor by the surrounding circumstances. The evidence shows that the Navy Department was carrying on extensive independent experiments with torpedoes, utilizing the skill and experience of its own officers. The defendant was occupied in developing its torpedo in conformity with the wishes of its sole customer. Inasmuch, however,

440 as the defendant was not prohibited from making torpedoes for others, some provision was necessary to protect the Government in its contributions to the joint result. The contract provision indicates, as the evidence shows, that this method was deliberately adopted by the Government as the most secure and efficient method of protecting its interest. There would be no security for that interest if the defendant, incorporating devices furnished by the Government, could afterwards sell those devices to other persons or governments unless the Navy Department could establish patentable invention in each instance. It seems plain to me that in the consideration of any contribution made by the Government, the prior art, as well as the defendant's actual knowledge, with respect thereto is as irrelevant as the question whether any such device was or is more or less efficient than another device which was available and might have been used. "Furnish", as used in the context, means simply supplying a device not then in use in the torpedo. It is urged that this conclusion will bear heavily upon the defendant, since it may conceivably result in depriving it of the commercial use of devices available to others as part of the prior art. But if the consequences of its formal agreement were at all relevant to the issue, it would be reasonable to suppose that they were carefully considered in the formation of its very valuable business relations with the Government. And, in any event, it would be obviously inequitable to permit it to use, for a period of years, in making torpedoes for the Government, a device furnished by the Government, and then when it seeks to sell the developed torpedo to other persons or governments, to raise for the first time an issue of prior knowledge or prior art.

441 It appears from the evidence that three of the devices relied upon by the Government were furnished under the 1905 contract and the fourth under the 1912 contract, and the claim is made by the defendant that since the 1912 contract superseded the previous contracts an injunction can issue only against violations of that contract. A subsequent contract covering the same subject matter as a prior contract doubtless supersedes the earlier contract. Here, however, each successive contract, while relating to torpedoes, covered different subject matters. In this case it appears that the restrictive provision concerning devices furnished

by the Government was incorporated in substantially the same terms in each successive contract, and I have no doubt that when once the design is furnished and notice given under any contract, the restrictive covenant applies under subsequent contracts so long as the device continues to be used in torpedoes made under those contracts.

The Bliss Company has notified the Government that it proposes to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo to a prospective purchaser. The expression "existing type" would ordinarily mean every type in existence or use, but inasmuch as the Bliss Company expressly refers, at the outset of its notice, to the 1912 contract, and the evidence is not clear whether any other type is at present in existence or use, the type of torpedo called for by that contract may be accepted as the type involved in this suit.

Accordingly, in the absence of any contention by the defendant that the penalty prescribed in the contract is exclusive, I have only to find which, if any, of the four devices relied upon by the
442 Government were furnished by it in accordance with the terms of the contract, and which, if any, of the devices thus furnished are embodied in the existing type of torpedo.

I find that designs for the following devices were furnished to the defendant by the Government, and that at the time such devices or designs were conveyed to the defendant by written communication from the Government, the Government stated to the defendant in writing in each instance that the device or design was embraced within the provisions of the restrictive clause of the contract: (1) the balanced turbine, as specified in Exhibits 28 and 29, dated Jan. 10, 1907; (2) ball bearings in the gyroscope, as specified in Exhibits 52 and 53, dated March 31, 1906; (3) improvement in inside superheater, as specified in Exhibits 54 to 57 inclusive, dated Sept. 18, 1906.

Of the foregoing three devices, I find that the balanced turbine is embodied in the existing type of torpedo. In reaching this conclusion my criterion has been: do the essential features and function of the device appear? If they do, then mechanical alterations, although they add to its efficiency, or even improvements which disclose invention, are immaterial.

A defense special to the balanced turbine has been strenuously urged by the defendant. It appears that the balanced turbine was invented and patented by Lieutenant Commander G. C. Davison, U. S. N. He applied for a patent under date of Oct. 19, 1906; the patent was allowed on Dec. 6, 1906, and was issued under date of June 25, 1907. Meanwhile, on December 27, 1906, Davison had assigned to the United States Navy Department the full and exclusive right to his invention; and on or about January 10,
443 1907, the design, Exhibit 28, had been conveyed to the Bliss Company by the Government. In October, 1907, Davison applied for a patent in Great Britain, and in the following year patents were issued to him in that country and several others. These foreign patents were assigned by Davison to the defendant. Davison testi-

fied that the told the commandant of the torpedo station and the chief of the Bureau of Ordnance of these assignments to the defendant. On these facts the defendant contends that the Government waived the restrictive covenant. That covenant, it asserts, was nothing more than a secrecy clause, and the balanced turbine having been published to the world by the issue of the patents, it would be inequitable to forbid the defendant, the assignee of the foreign patents, the use of a device available to others. The obvious answer to this argument has already been pointed out. While some of the provisions of the restrictive clause directly prohibit disclosure, it is also expressly agreed that "the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or for other governments." And even with respect to secrecy, it is apparent that there is no disclosure in the patent of what part, if any, of that invention is embodied in Exhibit 28 or in the existing type of torpedo. It seems necessary to point out that this suit is based upon contract, not upon patent infringement. For the defendant has indulged in some reflections upon the futility of an injunction against it as the assignee of foreign patents for the balanced turbine. But the Government does not sue as the assignee of a patent limited to the territorial boundaries of the United States. It sues for an injunction to

444 prevent the breach of a contract provision subject to no such territorial limitation.

The Government further contends that by virtue of the National Defense Act of 1911, the defendant should be restricted from disclosing, and therefore from making and selling torpedoes containing not only all the devices already considered, but several others (specified above) which, although suggested to the defendant by the complainant, with more or less particularity, were actually worked out by the defendant, and were not accompanied by any actual design or by the notice required by the restrictive covenant. I am of opinion that such a contention is not sound. The National Defense Act is a criminal statute, and a court of equity ordinarily has no jurisdiction to enjoin the commission of a crime. When, however, some interference, actual or threatened, with property or proprietary rights appears, the jurisdiction of a court of equity is not ousted by the fact that such interference is accompanied by or is itself a violation of the criminal law. If, in this instance, the exhibition and demonstration of the existing type of Bliss-Leavitt torpedo to any other person or government be a violation of the penal statute, doubtless the defendant would be subject to prosecution for the offense; if such exhibition and demonstration violates the property rights of the Government no doubt the court may grant such equitable relief as the case requires, but the fact that it was a violation of the criminal law would not be material to the consideration of equitable relief. Now, the complaint does not set up the violation of the penal statute as a separate cause of action, but avers that the defendant intends

445 "thereby to violate the laws of the United States," and prays that the defendant be enjoined from violating such laws. But the court can grant relief in this case only to prevent a viola-

tion of the complainant's contract rights. And, apart from the rights acquired by the Government pursuant to the terms of the agreement, the Bliss-Leavitt torpedo is the defendant's property.

Inasmuch as the existing type of torpedo contains a device the design for which was furnished by the Government pursuant to contract, the complainant is entitled to a permanent injunction.

VAN VECHTEN VEEDER, U. S. J.

Final Decree.

At a Stated Term of the District Court of the United States for the Eastern District of New York, Held at the United States Court Rooms, in the Borough of Brooklyn, City of New York, on the Fifth Day of May, 1914.

Present: The Honorable Van Vechten Veeder, District Judge.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

This action having been begun by the filing of a bill of complaint herein, and the issuance of a subpoena on the 27th day of May, 446 1913, and an order to show cause why a temporary injunction should not issue, returnable the fourth day of June, 1913, having been at the same time granted herein, and an order having been signed by Honorable Van Vechten Veeder on the 14th day of June, 1913, amending the complaint herein, and a copy of the answer having been filed to the said amended complaint on the 17th day of June, 1913, herein and a further order amending the said complaint having been signed by the Honorable Van Vechten Veeder on the 24th day of June, 1913, and an amended answer having been served therein, and an order having been granted on the 23rd day of July, 1913, continuing the injunction during the pendency of this action, and issue having been thereupon duly joined, a trial of the issues in this case was begun on the 10th day of November, 1913, and continued until the 24th day of November, 1913, and the complainant and defendant having filed their briefs and reply briefs, and an oral argument having been had herein on the 9th day of January, 1914, and due deliberation having been thereupon had, and an opinion having been filed herein by the Honorable Van Vechten Veeder, Judge of the District Court on the 14th day of April, 1914,

Now, on reading and filing the said opinion, and on all the other papers and proceedings herein, and on the exhibits and testimony herein, it is hereby,

Ordered, adjudged and decreed, that the defendant herein, its agents, servants, attorneys, and employees, and all persons acting for and in its behalf be and they hereby are perpetually restrained

and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States
447 of America, of what is known as the balanced turbine (either in its original form as specified in Exhibits 28 and 29 or in the form contained in Exhibit 27, being that form now used in the existing type of torpedo); and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of said balanced turbine, or of any torpedo or torpedoes which shall contain the same.

And it is

Further ordered, adjudged and decreed, that the complaint herein be dismissed as to each and every other device and design therein mentioned, except such balanced turbine; and also, as to those portions of the complaint which charge the defendant with an intent to violate the laws of the United States, and the regulations of the Navy Department made in conformity therewith.

And it is further ordered, adjudged and decreed, that neither party is awarded any costs as against the other.

VAN VECHTEN VEEDER, U. S. J.

448 *Petition on Appeal.*

(Filed May 7, 1914.)

District Court of the United States, Eastern District of New York.

In Equity. E. 1-100. E. 100.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

To the Honorable Judges of the United States District Court for the Eastern District of New York, Second Circuit:

The petition of the above-named defendant respectfully shows:

The above-named defendant conceiving itself aggrieved by the final decree made and entered in the above-entitled cause and filed in the office of the Clerk of this Court on the 5th day of May, 1914, does hereby appeal therefrom to the United States Circuit Court of Appeals for the Second Circuit for the reason specified in the assignment of errors filed herewith and prays that its appeal may be allowed and that a transcript of the record papers and proceedings upon which said appeal was made, duly authenticated, may be sent to the United States Circuit Court of Appeals for the Second Circuit.

Dated, New York, May 6th, 1914.

ARTHUR C. FRASER,
Solicitor for Defendant-Appellant,
170 Broadway, Borough of Manhattan, New York City.

The foregoing petition on appeal is hereby granted.
Dated, Brooklyn, May 6th, 1914.

VAN VECHTEN VEEDER,
United States Judge.

Endorsed: Due service of a copy of the within Appeal is hereby admitted this 6th day of May, 1914, Wm. J. Youngs, Solicitor for Complainant.

449

Citation.

(Filed May 7, 1914.)

E. 1-100.

E. 100.

By the Honorable Van Vechten Veeder, one of the Judges of the District Court of the United States for the Eastern District of New York in the Second Circuit, to the United States of America, Greeting:

You are hereby cited and admonished to be and appear before a United States Circuit Court of Appeals for the Second Circuit, to be holden at the Borough of Manhattan, in the City of New York, in the District and Circuit above-named, on the 5th day of June, 1914, pursuant to a petition of appeal filed in the Clerk's office of the District Court of the United States for the Eastern District of New York, wherein E. W. Bliss Company, defendant, is petitioner and appellant, and you are respondent and appellee, to show cause, if any there be, why the decree in said petition mentioned should not be corrected and speedy justice should not be done in that behalf.

Given under my hand at the Borough of Brooklyn, in the City of New York, in the District and Circuit above-named, this 6th day of May, in the year of our Lord One thousand Nine Hundred and Fourteen, and of the Independence of the United States the One Hundred and Seven.

VAN VECHTEN VEEDER,
*Judge of the District Court of the United
States for the Eastern District of New
York, in the Second Circuit.*

Endorsed: Due service of a copy of the within Citation is hereby admitted this 6th day of May, 1914. Wm. J. Youngs, Solicitor for Complainant.

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450

Assignment of Errors.

(Filed May 7, 1914.)

District Court of the United States, Eastern District of New York.

In Equity. E. 1-100. E. 100.

UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

The above named defendant E. W. Bliss Company, Appellant, makes the following assignment of errors in the above entitled cause in the decree entered therein on the fifth day of May, 1914.

1. That the Court erred in holding that the Balanced Turbine as contained in the existing type of Bliss-Leavitt torpedo is constructed according to a design furnished to defendant by complainant.

2. That the Court erred in holding that by virtue of any contract between complainant and defendant, defendant was prevented from communicating or exhibiting or selling to any other person firm or corporation than complainant, torpedoes containing a Balanced Turbine as contained in the existing type of Bliss-Leavitt torpedo.

3. That the Court erred in holding that a permanent injunction should issue against defendant enjoining and restraining it from communicating or exhibiting or selling to any other person, firm or corporation than complainant, torpedoes containing a Balanced Turbine as contained in the existing type of Bliss-Leavitt torpedo.

4. That the Court erred in holding that the Balanced
451 Turbine as contained in the existing type of Bliss-Leavitt torpedo was subject to the restrictions as contained in clause 20 of the contract of June 12, 1912 between complainant and defendant, or to the restrictions of any contract.

5. That the Court erred in holding that complainant furnished defendant any design for Balanced Turbine under the 1905 contract or under any contract.

6. That the Court erred in holding that the design for Balanced Turbine held to have been furnished defendant by complainant under the contract of 1905 was a device to which clause 19 of said contract applied.

7. That the Court erred in not holding that at the time the complainant is held to have furnished defendant the design for Balanced Turbine, the device shown in the said design was old and well known and that therefore it was not a device which was included in Clause 19 of the 1905 contract.

8. That the Court erred in not holding that at the time the complainant is held to have furnished defendant the design for Balanced Turbine, the said design was then in the possession of defendant and had been theretofore used by it, and that therefore it was not a design which was included in clause 19 of the 1905 contract.

9. That the Court erred in holding that the Balanced Turbine a design for which is held to have been supplied defendant by complainant was a "device" within the meaning of Clause 19 of the contract of 1905.

10. That the Court erred in not holding that the publication of the design for the Balanced Turbine in the Davison patent subsequent to the furnishing of a design therefor by complainant to defendant, relieved defendant from the restrictive provisions of the contract under which the said design is held to have been furnished defendant, or the contract of June 12, 1912, as to such Balanced Turbine.

11. That the Court erred in not holding that defendant could freely disclose the design for Balanced Turbine as contained in the existing type of torpedo without violation of the complainant's rights.

12. That the Court erred in holding that the complainant by virtue of the provisions of the contract between complainant and defendant of June 12, 1912 was entitled to restrain the defendant from exhibiting or communicating or selling to others than complainant devices the designs for which had been furnished by complainant to defendant before the execution and delivery of said contract.

13. That the Court erred in holding that the complainant by virtue of the provisions of the contract between complainant and defendant of June 12, 1912 was entitled to restrain the defendant from exhibiting or communicating or selling to others than complainant devices the designs for which were not furnished by complainant to defendant under the provisions of that contract.

14. That the Court erred in holding that the provisions of Clause 20 of the contract of June 12, 1912 applied to devices the designs for which were known to defendant and available for defendant's use, or which had been used by defendant prior to their being furnished to defendant by complainant.

15. That the Court erred in holding that the restrictive provisions of Clause 20 of the contract of June 12, 1912, and like provisions in previous contracts between complainant and defendant, applied to any device the design for which was supplied by complainant to defendant which was not then in use in the torpedo, irrespective of whether or not said device originated with or was previously known to or had theretofore been used by defendant.

16. That the Court erred in holding that the word "furnish" in clause 20 of the contract of June 12, 1912, means supplying a device not then in use in the torpedo.

17. That the Court erred in holding that the restrictions contained in Clause 19 of the contract of 1905 applied, as to devices the designs for which were furnished by complainant to defendant under said contract, to subsequent contracts so long as said devices continued to be used in torpedoes made under said subsequent contracts.

18. That the Court erred in not holding that clause 19 in the 1905 contract between complainant and defendant, and clause 20 in the 1912 contract, were limited to devices which originated with or were the exclusive property of the complainant and were by it furnished defendant.

19. That the Court erred in holding that complainant had given defendant notice as required by Clause 19 of the 1905 contract with relation to the Balanced Turbine.

20. That the Court erred in holding that complainant's rights under the 1905 contract continued after the expiration thereof.

21. That the Court erred in holding that the disclosure by defendant of devices the designs for which are found to have been furnished to defendant by complainant under the 1905 contract, could be enjoined under the 1912 contract.

22. That the Court erred in holding that any acts or threatened acts of this defendant violated or threatened to violate any stipulations, covenants or agreements contained in any contract between complainant and defendant.

23. That the Court erred in holding that defendant's property rights under the Davison foreign patents are affected by any contract between defendant and complainant.

24. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States what is known as the Balanced Turbine (either in its original form as specified in the Exhibits 28 and 29 or in the form contained in Exhibit 27, being that form now used in the existing type of torpedo); or from communicating or exhibiting to any such parties or governments the construction of or exhibiting the performance of said Balanced Turbine or of any torpedo or torpedoes which shall contain the same.

25. That the Court erred in excluding, over the defendant's objection and exception, evidence that no claim was made by the Government, or its officers, that the balanced turbine was covered by the 19th clauses of the contracts between the contract of November 22, 1905, and that of June 12, 1912, when the said intervening contracts were negotiated and made.

26. That the Court erred in not dismissing the bill of complaint.

27. That the Court erred in not awarding defendant costs.

ARTHUR C. FRASER.

Solicitor for Defendant-Appellant.

Endorsed: Due service of a copy of the within Assignment of Errors is hereby admitted this 6th day of May, 1914. Wm. J. Youngs, Solicitor for Complainant.

455

Bond.

(Filed, May 7, 1914.)

District Court of the United States, Eastern District of New York.

In Equity. E-1-100. E-100.

UNITED STATES OF AMERICA,
against
E. W. BLISS COMPANY.

Know all men by these presents.

That we, Casualty Company of America, of 133 William St., New York City, a corporation of the State of New York, duly authorized to transact business pursuant to the Act of Congress approved August 13, 1894, is held and firmly bound under the United States of America, in the full and just sum of Five Hundred Dollars (\$500) lawful money of the United States, to be paid to the United States of America, its legal representatives or assigns; to which payment, well and truly to be made, the said Company binds itself, its successors and assigns, jointly and severally, firmly by these presents.

Dated, New York, May 6th, 1914.

Whereas the above-named defendant, E. W. Bliss Company, has prosecuted an appeal to the United States Circuit Court of Appeals for the Second Circuit, to reverse the decree rendered in the above-entitled suit by the Judge of the District Court of the United States for the Eastern District of New York.

Now, therefore, the condition of the above obligation is such that if the said E. W. Bliss Company shall prosecute said appeal to effect, and answer all costs if it fail to make said plea good, then the
456 above obligation to be void; else to remain in full force and
virtue.

CASUALTY COMPANY OF AMERICA,
By CHESTER E. BATES,*Res. Vice-Pres.*

Attest:

CHAS. H. SCHAFER, JR.,
*Res. Ass't Sec.*STATE OF NEW YORK,
County of New York, ss:

On this 6th day of May, 1914, before me personally came Chas. H. Schafer, Jr., known to me to be the Res. Ass't Secretary of the Casualty Company of America the corporation described in and which executed the foregoing instrument, who, being by me duly sworn, did depose and say that he resides in the City of New York, in the State of New York; that he is the Res. Ass't Secretary of said

Company, and knows the corporate seal thereof; that the seal affixed to the foregoing instrument is such corporate seal, and was thereto affixed by order and authority of the Board of Directors of said Company, and that he signed said instrument as Res. Ass't Secretary of said Company by like order and authority; and that he is acquainted with Chester E. Bates and knows him, to be the Res. Vice President of said Company, and that the signature of said Chester E. Bates subscribed to said instrument is in the genuine handwriting of said Chester E. Bates, and was thereto subscribed by order and authority of said Board of Directors and in the presence of said deponent; and that the liabilities of said Company do not exceed its assets, as ascertained in the manner provided in Chapter 33 of the Laws of New York for the year 1909, and the laws amendatory thereof and supplementary thereto.

457 (Signed)

J. H. NORTH,

Notary Public, New York Co.

Resolutions.

"Resolved, That the President or a Vice-President, or Acting Vice-President and the Secretary, and Assistant Secretary, or an Acting Secretary of the Casualty Company of America be and they hereby are authorized and empowered to execute and deliver, and attach the seal of the Company, to any and all bonds or other obligations for and on behalf of the Company, further

"Resolved, That the President or a Vice-President in conjunction with the Secretary or an Assistant Secretary of the Casualty Company of America may from time to time appoint Resident Vice-Presidents, Resident Assistant Secretaries and Attorneys in Fact to represent and act for and on behalf of the Company, and the President or a Vice-President or the Secretary, the Board of Directors or the Executive Committee may at any time remove any such Resident Vice-President, Resident Assistant Secretary or Attorney in Fact and revoke the power and authority given him; further

"Resolved, That Resident Vice-Presidents in conjunction with the Secretary or an Assistant Secretary or a Resident Assistant Secretary and Attorneys in Fact may be given full power and authority to execute for and in the name and on behalf of the Company, any and all bonds, recognizances, contracts of indemnity and other writings obligatory in the nature of a bond, recognizance or conditional undertaking, and any such instrument executed in such manner shall be as binding upon the Company as if signed by the President and sealed and attested by the Secretary."

458 I, Chas. H. Schafer, Jr., Res. Asst. Secretary of the Casualty Company of America have compared the foregoing resolutions with the originals thereof, as recorded in the Minute Book of said Company, and do hereby certify that the same is a correct and true transcript therefrom, and of the whole of said original resolutions, which were duly adopted by the Board of Directors of said Company under date of February 20, 1912. Given under my hand

and seal of the Company at the City of New York, this 6th day of May, 1914.

[SEAL.]

(Signed)

CHAS. H. SCHAFER, JR.

Res. Ass't Secretary.

Verified statement of assets and liabilities of Casualty Co. of America, attached to original Bond on file in Clerk's Office.

Endorsed. The within bond is hereby approved as to form and sufficiency of surety, May 6th, 1914. Van Vechten Veeden, U. S. District Judge. Service of a copy of within Bond is hereby admitted May 6th, 1914. Wm. J. Youngs, U. S. Attorney.

459

Petition on Appeal.

United States District Court. Eastern District of New York.

In Equity.

UNITED STATES OF AMERICA, Complainant,

against

E. W. BLISS COMPANY, Defendant.

To the Honorable Judges of the United States District Court for the Eastern District of New York, Second Circuit.

The petition of the above named complainant respectfully shows:

The above named complainant conceiving itself aggrieved by the final decree made and entered in the above entitled cause and filed in the office of the Clerk of this Court on the fifth day of May, 1914, does hereby appeal therefrom to the United States Circuit Court of Appeals for the Second Circuit for the reason specified in the assignment of errors filed herewith and prays that its appeal may be allowed and that a transcript of the record, papers and proceedings upon which said appeal was made, duly authenticated, may be sent to the United States Circuit Court of Appeals for the Second Circuit.

Dated, Brooklyn, N. Y., May 25, 1914.

(Signed)

WM. J. YOUNGS,

*Solicitor for Complainant-Appellant,
213 Federal Building, Brooklyn, New York.*

The foregoing petition on appeal is hereby granted.

Dated, Brooklyn, N. Y., May 26, 1914.

VAN VECHTEN VEEDER,

U. S. D. J.

460

Citation.

By the Honorable Van Vechten Veeder, one of the Judges of the District Court of the United States for the Eastern District of New York in the Second Circuit. To the E. W. Bliss Company, Greeting:

You are hereby cited and admonished to be and appear before the United States Circuit Court of Appeals for the Second Circuit to be holden in the Borough of Manhattan, City of New York, in the district and circuit above named, on the 25th day of June, 1914, pursuant to a petition of appeal filed in the Clerk's office of the District Court of the United States for the Eastern District of New York, wherein the United States of America is the complainant, petitioner and appellant, and you are respondent and appellee, to show cause, if any there be, why the decree in said petition mentioned should not be corrected and speedy justice should not be done in that behalf.

Given under my hand at the Borough of Brooklyn, in the City of New York, in the District and Circuit above named, this 26th day of May, in the year of our Lord, One thousand nine hundred and fourteen, and of the Independence of the United States the One hundred and Thirty-eighth.

VAN VECHTEN VEEDER,
*Judge of the District Court of the United States for
the Eastern District of New York, in the Second Circuit.*

Due service of a copy of the within citation is hereby admitted this 26th day of May, 1914.

ARTHUR C. FRASER,
Solicitor for Respondent.

461

Assignment of Errors.

United States District Court, Eastern District of New York.

In Equity.

UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

The above named complainant, the United States of America, appellant, makes the following assignment of errors in the above entitled cause in the decree entered herein on the fifth day of May, 1914.

1. That the Court erred in holding that the ball bearings for gyroscope, as contained in the existing type of Bliss-Leavitt torpedo, is not constructed according to a design furnished to the defendant by this complainant.

2. That the Court erred in failing to hold that, by virtue of the various contracts of 1905 and 1912 made between the complainant and the defendant, the defendant was prevented and should be restrained from communicating or exhibiting or selling to any person, firm or corporation, other than the complainant, torpedoes containing ball bearings for gyros as contained in the existing type of Bliss-Leavitt torpedo.

3. That the Court erred in failing to hold that a permanent injunction should issue against the defendant enjoining and restraining it from communicating or exhibiting or selling to any other person, firm or corporation other than the complainant, torpedoes containing ball bearings for gyros as contained in the existing
462 type of Bliss-Leavitt torpedo.

4. That the Court erred in holding that the ball bearings for gyroscope was not subject to the restrictions contained in Clause 20 of the contract of June 12, 1912, between the complainant and the defendant, or to the restrictions of any contract, previously entered into between the parties hereto.

5. That the Court erred in holding that the complainant did not furnish the defendant the design for the ball bearings for gyros under the 1912 contract, or under any contract previously entered into between the parties hereto.

6. That the Court erred in holding that the defendant could freely disclose the design for ball bearings for gyros as contained in the existing type of torpedoes, without violation of complainant's rights, under the several contracts and under the laws of the United States.

7. That the Court erred in refusing to hold that the complainant by virtue of the provisions of the contract between complainant and the defendant of June 12, 1912, was entitled to restrain the defendant from exhibiting or communicating or selling to others than the complainant, the device for ball bearings for gyroscope, which had been furnished by the complainant to the defendant before the execution and delivery of the said contract.

8. That the Court erred in refusing to hold that the complainant, by virtue of the laws of the United States, was entitled to restrain the defendant from exhibiting or communicating or selling to others than the complainant, the device for ball bearings which had been furnished by the complainant to the defendant.

9. That the Court erred in refusing to hold that the com-
463 plainant, by virtue of the provisions of the contract between the complainant and the defendant of June 12, 1912, was entitled to restrain the defendant from exhibiting or communicating or selling to others than the complainant the several devices mentioned in the complainant's bill of complaint, designs for which were furnished by the complainant to defendant under the provisions of the contract.

10. That the Court erred in failing to hold that the defendant should be restrained from selling, exhibiting or in any way exploiting the existing type of torpedo to any other person, corporation or government other than complainant, on the ground the

same would be a violation of the laws of the United States, and particularly the Act of March 3, 1911.

11. That the Court erred in holding that "the court can grant relief in this case, only to prevent a violation of the complainant's contract rights."

12. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant as to the design and construction of the changes made in the type of rudders was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than complainant under the terms of the said Act of March 3, 1911.

13. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the method of starting torpedoes, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

14. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the type of depth engine, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911 commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

15. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the curved fire gyro, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

16. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the superheater, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than complainant under the terms of the said Act of March 3, 1911.

17. That the Court erred in not holding that each and all of the

various devices and designs communicated by complainant to the defendant, were devices and designs of which the defendant had such knowledge communicated to it by the complainant herein as would warrant the Court in restraining the defendant from communicating the same or any part thereof to any person, corporation or government other than the complainant in this action.

18. That the Court erred in failing to grant a permanent injunction to the complainant as against the defendant, upon the ground that the communicating of the complete construction and operation of the existing type of torpedo and the demonstrating the operation thereof to any person other than the complainant would be, and is, contrary to the Public Policy of this Nation.

19. That the Court erred in dismissing the bill of complaint as to those portions thereof as related to ball bearings for gyroscopes, design for the superheater and compound regulation of air, changes in type of rudders, changes in method of starting torpedoes, changes in the type of depth engine, changes in curved fire gyro and changes in the superheater.

20. That the Court erred in dismissing the portions of the bill of complaint herein which applied to other than the balanced turbine as not being in violation of the National Defense Act hereinbefore specifically set forth.

21. That the Court erred in dismissing the portions of the
466 bill of complaint herein which applied to other than the balanced turbine, for the reason that the same is against the Public Policy of this Nation.

22. That the Court erred in not awarding the complainant costs and disbursements of this action.

Dated, May 25, 1910.

WILLIAM J. YOUNGS,
United States Attorney and Solicitor for Complainant,
Federal Building, Brooklyn, N. Y.

Due service of a copy of the within Assignment of Errors is hereby admitted this 26th day of May, 1914.

ARTHUR C. FRASER,
Solicitor for Respondent.

467

Order for Withdrawing Exhibit.

At a stated term of the United States District Court for the Eastern District of New York, held at Brooklyn, N. Y., on the 3rd day of August, 1914.

Present: Hon. Van Vechten Veeder, Judge.

In Equity.

UNITED STATES OF AMERICA, Plaintiff-Appellant,
against
E. W. BLISS COMPANY, Defendant-Appellant.

On reading and filing the annexed consent of the United States Attorney for the Eastern District of New York, and on motion of Arthur C. Fraser, Esq., attorney for the defendant-appellant, it is

Ordered that the certified copy of file contents of an application for patent of Frank M. Leavitt, Patent No. 1,088,080, granted February 24, 1914, filed with the Court as an exhibit for defendant on or about April 7, 1914, be, and the Clerk of the Court hereby is, directed to deliver the same to Arthur C. Fraser, Esq., attorney for defendant-appellant, for the purpose of printing same in the transcript of record on appeal.

VAN VECHTEN VEEDER,
U. S. D. J.

The entry of the foregoing order is hereby assented to.

WM. J. YOUNGS,
United States Attorney for the Eastern District of New York.

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Stipulation.

United States District Court, Eastern District of New York.

In Equity.

THE UNITED STATES OF AMERICA, Plaintiff-Appellant,
against
E. W. BLISS COMPANY, Defendant-Appellant.

It is hereby stipulated by and between the attorneys for the respective parties hereto that Defendant's Exhibit 115, Printer's Proof of 1905 Contract, marked in evidence November 17, 1913, is worded the same as the 1905 contract, Complainant's Exhibit No. 1, except that it does not contain paragraph 19 of said 1905 contract, and that said Defendant's Exhibit 115 may be omitted from the certified transcript of record on appeal herein and from the printed copies of said transcript.

It is further stipulated and agreed that Complainant's Exhibits 34, 35, 36, 37, 44, 45, 46, 47 and 48, and Defendant's Exhibits 118, 119, 120, 122, 123, 124, 125, 126, 127, 137 and 138, may be omitted from the certified transcript on appeal herein and from the printed copies of said transcript, and that the originals of the said exhibits shall be produced at the argument on appeal herein and may be referred to by the Court or by the attorney for either party.

It is further stipulated and agreed that Complainant's Exhibit 49, Davison British patent No. 22,130 of 1907, has the following caption and preamble, to wit:

469 "No. 22,130.

A. D., 1907.

(Under International Convention.)

"Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in the United States) 19th Oct., 1906.

"Date of Application (in the United Kingdom) 7th Oct., 1907.

"At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative.

"Accepted, 16th Jan., 1908.

Complete Specification.

"Improvements in Automobile Torpedoes."

"I, Gregory Caldwell Davison, a citizen of the United States of America, residing at the United States Torpedo Station, Newport, in the County of Newport and State of Rhode Island, U. S. A., Lieutenant Commander, United States Navy, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:"

It is further stipulated and agreed that the specification and drawings of this patent are substantially identical with those of Complainant's Exhibit 3, Davison United States patent No. 858,266, and for this reason the said Exhibit 49 may be omitted from the certified transcript of record on appeal and the copies thereof.

It is further stipulated and agreed that an uncertified printed Patent Office copy of U. S. Letters Patent No. 1,088,080, dated February 24, 1914, and issued on the application of Frank M. Leavitt, Ser. No. 689,136, may be included in the certified transcript of record herein and the copies thereof, in lieu of the Defendant's Exhibit,

470 being a certified copy of specification and drawing of said application for patent as allowed, and which was submitted to the Court February 10, 1914.

Dated, August 3, 1914.

WM. J. YOUNGS,

United States Attorney for the Eastern District of New York.

ARTHUR C. FRASER,

Solicitor for Defendant-Appellant.

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DEFENDANT'S EXHIBIT 130.

No. 9558, Oct. 12, 1901.

Frank M. Leavitt, M. E., 258 Broadway.

Telephone 3099 Cortland.

NEW YORK, October 10, 1901.

MY DEAR MR. FISKE: Referring to our conversation in regard to the application of the turbine to the torpedo I have been trying to scheme out some proposition which the Department would be likely to accept and which at the same time would be fair to the contractors. As I told you it would be impossible to give a definite guarantee and the only plan I can suggest is the following:

In the first place, I should consider it very unwise to build a torpedo until the question of the efficiency and adaptability of the turbine has been more fully tested, as it would be a useless expense. From the experiments we have already made, I believe the turbine holds out great possibilities.

I think the proper course would be to construct an experimental turbine and subject it to thorough tests with the dynamometer. The cost of this would probably not exceed \$3,000 and I believe the Bliss Company would be justified in accepting an order at that price. It would have however, to be considered purely as an experiment without guarantee.

If this should terminate successfully and the turbine showed good efficiency as compared with the Whitehead engine so as to warrant its being tested in a service torpedo, we would have some basis on which to make a guarantee.

The Curtis turbine is, I believe, by all odds the best one to tie to.

472 The General Electric Company have adopted it to drive their generators and experiments made at Schenectady have shown it to be extremely economical of steam. In using air in place of steam there are some unknown factors which would have to be determined by experiment, but there seems to be no reason why the turbine could not be made to work as economically with air as with steam.

It is certain that if this can be accomplished it will be the ideal machine for propelling a torpedo on account of simplicity of construction, durability and general reliability. It also has an inci-

(Underlined by B. O. F.)

dental advantage in not requiring the trappy little retarding latch arrangement, and there is no possibility of a misfire due to engine being caught on the center.

Very truly yours,
(Signed)

F. M. LEAVITT.

DEFENDANT'S EXHIBIT 130 (a).

No. 913.

No. 9558. Oct. 12, 1901.

Office of Inspector of Ordnance, at works of The E. W. Bliss
Company,

17 Adams St., Brooklyn, N. Y.

Oct. 11, 1901.

SIR: 1. I have the honor to state that a few days since, I said to Mr. Frank M. Leavitt, who used to be Chief Engineer of the Bliss Co., that I wished he would design some plan for adapting the turbine to the torpedo. He replied that he would be glad to do so; but that he could think of no proposition that would be attractive to the Bureau, because no one knew enough about the action of compressed air in turbines to give any guaranty.

2. This morning I have received a personal letter from him, which I enclose herewith for the Bureau's consideration. Mr. Leavitt has given his consent, by telephone, to my doing this.

3. The torpedo has become so excessively complicated, that any effort to simplify it must commend itself to all Naval men. And while \$3,000 is a good deal to pay for a pure experiment, yet success seems so probable, and success, if gained would be so advantageous, that I venture to recommend that the Bureau direct me to get a definite proposition from the E. W. Bliss Co. Though Mr. Leavitt is no longer Chief Engineer of the Company, it is he who would design the machinery and make the experiments.

4. Return of Mr. Leavitt's letter is requested.

Very respectfully,

B. A. FISKE,

Lieut. Comdr., U. S. N.,

Inspector of Ordnance.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

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DEFENDANT'S EXHIBIT 130 (b).

Address Bureau of Ordnance, Navy Department, and Refer to No.
9558.

(Encls.)

DEPARTMENT OF THE NAVY,

BUREAU OF ORDNANCE,

WASHINGTON, D. C., October 14, 1901.

SIR: Referring to your letter No. 913 of the 11th instant, relative to the adoption of a turbine for torpedoes, and enclosing a letter from Mr. F. M. Leavitt on the same subject:

1. The Bureau approves of your recommendation that you obtain a definite proposition from the E. W. Bliss Co., relative to the con-

struction of an experimental turbine for use in a 5-meter, 45 c/m torpedo.

2. In the opinion of the Bureau, such a turbine should be designed as follows:

(a) Not to exceed in weight the engine at present used in the 5-meter, Mark II torpedo.

(b) To be of such a form as to cause the least possible change in arrangements of the other mechanism of the torpedo.

(c) To use air superheated to the highest practicable temperature.

(d) To develop not less than 90 horse power, in other words, to be at least equal to the reciprocating engine in Mark II, 5-meter No. 1, using superheated air.

3. In addition to the construction of such a turbine, the Bliss Company—

(a) To furnish the Bureau with blue-prints showing details, and a complete description of the device.

475 (b) To conduct dyn-ometric tests and to furnish the Bureau all data obtained from same,—such data to include temperature of air at admission and exhaust, pressure of air; horse power developed; energy developed per pound of air used; speed of turbine, etc.

(c) Upon completion of tests to hold the turbine subject to the orders of the Bureau.

4. Mr. Leavitt's letter is returned herewith, as requested.

Respectfully,

(Signed)

CHARLES O'NEIL,

Chief of Bureau of Ordnance.

Inspector of Ordnance, U. S. N., E. W. Bliss Company, 17 Adams St., Brooklyn, N. Y.

K. W.-F.

DEFENDANT'S EXHIBIT. 128.

No 9791, Oct. 19, 1901.

The E. W. Bliss Company,

Offices: Adams & Plymouth Streets, Borough of Brooklyn.

NEW YORK, N. Y., Oct. 18, 1901.

SIR: Your letter No. 9558, of October 14, 1901, to the Inspector of Ordnance, U. S. N., at these works, has been handed to us. As the Bureau is already aware, we have done considerable experimenting along the lines of driving the torpedo by means of a turbine, but these experiments were brought to an abrupt termination by the total wreckage of the apparatus, due to an accident. These experi-

476 ments went far enough, however, to convince us that the turbine is the ideal motor for driving the torpedo, providing its efficiency can be brought up to the requisite point, but we abandoned the work on account of the expense. Since that time, the turbine has been more fully developed, and elaborate tests have

shown it to compare favorably in steam consumption with the most economical multiple expansion steam engines.

As the Whitehead engine is not economical, as compared with stationary engines run by compressed air, it seems fair to assume that a turbine can be developed which will be superior to it, but we would not care to go so far as to guarantee this result.

We will agree to design and construct a turbine, in accordance with the details given in the Bureau's letter above referred to, and make exhaustive dyna-metric tests, at the conclusion of which the apparatus and all data are to be the property of the Bureau. Our charge for this work will be Three Thousand (\$3,000) Dollars.

Before beginning the construction of the turbine, we would be pleased to submit detail drawings to the Bureau, and would be glad of any suggestions it may see fit to make.

We will be able to conform to all the requirements of the Bureau's letter, with the exception, possibly, of measuring the temperatures. We would endeavor to do this, but on account of the shortness of the run, we may not be able to satisfactorily accomplish it. We will be able to build the machine so as to develop ninety (90) horsepower, but the point to be determined by the dynamometer test is the duration of time through which this amount of power can be maintained, with the available supply of air. The dynamometer

tests of the No. 1 torpedo, furnished to the Bureau with the
477 superheater showed that the engine developed thirty five thousand (35,000) foot-pounds of work for each pound of air used. A turbine performing in a similar manner, and developing ninety (90) horse-power, would then use air at the rate of 1.4 pounds per second, and taking seventy (70) pounds as the extreme weight available, the length of the run would be fifty (50) seconds. Making a conservative estimate of the speed with ninety (90) horsepower, the torpedo should travel thirty six (36) knots per hour, or, in fifty (50) seconds, it should cover a range of about one thousand (1,000) yards. The results would vary according as the turbine proves more or less efficient than the Whitehead engine.

Respectfully,

E. W. BLISS CO.,

W. A. PORTER,

Vice President.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

DEFENDANT'S EXHIBT 130 (c).

Address Bureau of Ordnance, Navy Department, and Refer to
No. 9558.

DEPARTMENT OF THE NAVY,
BUREAU OF ORDNANCE,
WASHINGTON, D. C., October 21, 1901.

SIR: 1: The Bureau has today made a requisition, No. 72, on the Bureau of Supplies and Accounts to have an order placed with the

E. W. Bliss Company, through you, for a turbine for automobile torpedoes, and test of same, at an estimated cost of \$3,000.00.

2. This is to cover the turbine and test of same, as specified
478 in the Bureau's letter of October 14, 1901, No. 9558.

Respectfully,

CHARLES O'NEIL,
Chief of Bureau of Ordnance.

The Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn,
N. Y.

DEFENDANT'S EXHIBIT 101.

No. 3677. May 6, 1902.

Address Bureau of Ordnance, Navy Department and refer to No.—

Department of the Navy.
Washington, D. C.

Bureau of Ordnance.

April 26, 1902.

SIR: Referring to the experimental turbine for torpedoes ordered
by the Bureau from the E. W. Bliss Company, Brooklyn, N. Y.:

1. In obedience to the Department's order No. 312474 of the 22nd
instant, I proceeded to the works of E. W. Bliss Company, and on
the 24th instant witnessed a dynamometric test of the turbine, of
which the following is a report:

Description of Turbine.

The turbine is known as the Curtis type, and in principle, par-
takes of the qualities of both the de Laval and the Parson's but
cannot properly be classed with either. Like the de Laval the motive
fluid (steam, compressed air, or other gas) passes through a nozzle
in which it expands, attaining a high velocity before striking the
buckets of the turbine. Like the Parson's the gas passes

479 through a series of alternately fixed and moving buckets or
vanes. In this turbine there are five parallel nozzles, two
rows of moving buckets, and one row of fixed buckets or guide vanes.
The arrangement of these and the course of the air through the tur-
bine is shown in sketch, Fig. 1. There is also forwarded herewith
a complete set of working drawings of the turbine and superheater.

The nozzles are arranged along a portion of the forward circum-
ference of the turbine, and are inclined as shown in sketch. The
throats of the nozzles are all open to the pipe leading from the tor-
pedo air flask, so that each nozzle receives air at the same pressure
as the other nozzles.

The buckets are arranged like curved radial teeth on the outer
surface of the buckets rings, the air entering on the forward side
and leaving on the after side.

The nozzles are made of composition, and are accurately formed. The throat is rounded and of circular cross section. The cross sectional area of the nozzles gradually increases and assumes a rectangular form at the mouth of the nozzle. The form of the nozzle has an important bearing on the efficiency of the turbine, and is such that as the air flows through it expands, thus increasing its velocity and acquiring kinetic energy at the expense of its original temperature and pressure. In the properly shaped nozzle a gas under pressure can be made to convert all its available energy into kinetic energy, so that if proper means are provided for absorbing this energy by impact upon suitable movable surfaces, the total theoretical available energy of the gas may be converted into useful work. This is the whole theory of steam or compressed air turbines, and is to a great degree practically realized in this device.

Buckets: As before stated there are two sets of moving
480 bucket rings. Each is machined out of one piece of tool steel, and is so strongly constructed that there is no danger of the buckets ever becoming bent or broken, due to the force or impact of the gas, or of the centrifugal force due to the high speed of the turbine. Two special machines have been designed for machining the buckets—one by the General Electric Company, and the other by F. M. Leavitt. In addition to the strength given the buckets by being cut from one piece of steel, they are further strengthened by a hoop which encloses their ends and which is riveted through the buckets, thus causing each bucket to take up a portion of the strain due to the impact of the gas on the buckets in wake of the nozzles.

A section in the plane of the axis of the turbine is shown in the general drawing. It will be noticed that the sectional area for the passage of the gas through the buckets gradually increases, thus allowing for the loss of velocity of the gas due to the energy imparted to the turbine.

Gearing: In order to be efficient, it is necessary that a turbine of such small size and great power should run at a rather high speed. As the propellers of the torpedo are designed to run at a considerably lower speed, a compact system of gearing is provided by which the speed is reduced in the ratio of 5 to 1. In other words, the turbine makes 5 revolutions to 1 revolution of the propeller shaft.

Casing: The entire turbine, and gearing are enclosed in a casing, as shown in the drawings. The entire weight of the turbine casing, gearing and shaft is 90 pounds. This is almost exactly equal to the weight of the engine of the Whitehead 5-meter Mark II torpedo.

As the engine of the turbine is surrounded by water, the
481 greater the displacement of either, the less the weight of the torpedo when in the water. On this account the turbine gives the torpedo 20 pounds buoyancy, which 20 pounds may be utilized for other purposes.

Exhaust: It will be noticed in the drawing that the turbine is designed to exhaust through the hollow propeller shaft of the torpedo, as is done with the engine now in use. But on account of the great power developed it has been found that the exhaust thus provided is too small. It is so small that a back pressure of 35 lbs. above the

atmosphere has been experienced. It was therefore found necessary to provide an exhaust during the experiments through the casing of the turbine, the turbine has developed as much as 108 horse-power, and is capable of developing more provided a sufficient quantity of air at a sufficient pressure is supplied. Even including the gearings, shafting and casing, the weight of this machine which develops over 100 horse-power, is only 90 lbs., and it occupied such a small space that one could easily carry it in a hand satchel. The parts which actually develop this power are about half this weight and occupy only about half this space. The total space occupied is that of a cylinder one foot in diameter and one-half foot in length. The impression conveyed by the sight of the actual machine is, that it is smaller than it appears from an examination of the drawing.

Arrangement for Test.

The turbine was designed with a view of actually placing it in a torpedo in the position occupied by the present engine. The after-body of a Whitehead 5-meter Mark II torpedo was loaned by the Bureau to the E. W. Bliss Company for the purpose of experiment, and the turbine was installed therein. It was found that
482 sufficient space was left for the installation of the other mechanism which belong in the engine compartment, viz: the steering engine, starting mechanism, reducing valve, etc.

An air flask for a Whitehead 5-meter Mark II torpedo which had been rejected previously on account of superficial scratches was utilized, having the after-body attached thereto. The air flask was fitted with the Leavitt superheater. The propellers of the torpedo were removed, and in the place of the after propeller was placed a steel disc about 3 feet in diameter, forming a part of the dynamometer to be described later.

The torpedo thus assembled was placed in a tank of water with the upper surface of the torpedo just awash. The dynamometer consisted of a rotating disc attached to the propeller shaft of the torpedo.

* * * * *

The entire arrangement is represented diagrammatically in Fig. 2. A sample sheet from the recording cylinder is shown in Fig. 3 on a reduced scale.

* * * * *

The Test: The air flask was charged to a pressure of 1580 lbs., the superheater prepared, and all arrangements for the test made as above described. Air from the flask was turned on the turbine. Immediately everything was in operation and functioned satisfactorily.

* * * * *

History of the Curtis Turbine.

This type of turbine is the invention of Mr. Curtis, a graduate of Stevens' Institute, Hoboken, N. J. The right to manufacture it is possessed by the E. W. Bliss Company and the General Electric
483 Company. In its application to steam, it may be said to have passed beyond the experimental stage, for it has been exten-

sively developed by the General Electric Company at an expense estimated at \$500,000.00. It is stated that the General Electric Company have built turbines for driving dynamos ranging from 10 kilowatts to 5,000 kilowatts. The efficiency as regards steam consumption seems to be well established, being from 12 to 14 lbs. of steam per horse-power hour when exhausting into a vacuum.

The E. W. Bliss Company has built about 30 small turbines of about 35 horse-power for pulverizers. One of those has been in use two years and has never given trouble. This firm has also just completed a turbine for a steam yacht of 1500 horse-power, economy tests with which have not yet been made, but it is expected that the steam consumption will be 14 lbs. per horse-power hour.

* * * * *

Considering that this is the first turbine of this type using air ever constructed, further improvement and development seem possible. At the same time Mr. Leavitt, the designer, has had the assistance and advice of the experts of the General Electric Company in this line, thereby profiting by their past experience.

The turbine for torpedoes constructed by E. W. Bliss Company a few years ago was not of the same type as the present one, though the principle was, of course, much the same.

Another point worthy of notice is in regard to the bearings of the rotating bucket wheels. In other types great stress has been placed upon the necessity of accurately balancing the rotating parts and in securing automatic adjustments so that the turbine will always
484 rotate about its center of mass. In the De Laval turbine, this is secured by using a flexible shaft. In the Parson's it is secured by using flexible bearings. In the torpedo turbine, the working portions are balanced, but beyond that no special arrangement of bearings is required. The bearings used are simple, strong and durable, and are oiled by a hole leading from the oil cup through the centre of the shaft and cut through a radial hole in the shaft in the middle of the bearing.

Summary of Advantages of Turbine for Torpedoes.

* * * * *

The Gyroscopic Effect.

Fear has been expressed by some that the gyroscopic effect of the turbine will be so great as to make the torpedo unmanageable, or at least render it impossible to use the adjustable gyroscopic steering gear. But upon computing the gyroscopic effect and the effect of the rudders, it is found that such fears are without reason.

Further Experiments.

The E. W. Bliss Company is now constructing a new set of nozzles designed to use air at a pressure of 400 lbs. at the throat of the nozzle. This change will undoubtedly show a greater amount of work per pound of air used, and may, perhaps, increase the total output of

energy from the torpedo. The goal for which they are striving is to obtain a total output of 3,000,000 ft. lbs.

Certain changes in the superheater are also being made so as to increase its efficiency.

Photographs of the turbine will be taken. When the further tests above mentioned have been completed a report of the results will be made.

485

Recommendations.

If the further tests increase the efficiency of the turbine so that the total output of energy exceeds that of the engine, it is recommended that a torpedo be fitted with this turbine and given service runs as final tests. Although the turbine is now in a torpedo it will be impracticable to give it a run in the water; first, because the exhaust through the shaft is inadequate, and, second, because it would be awkward to arrange the other attachments, oil cups, steering engine, etc., without mutilating the present after-body. To have a proper torpedo for this purpose, it will be necessary to remodel and construct a new after-body, with greater diameter of propeller shaft and a different arrangement for steering gear and other parts. This could, however, be done very cheaply.

The Bliss Company has the air flask now in use and already fitted with a superheater. The turbine is available. The Bureau could furnish an exercise head. The only new part required will be the after-body. This the Bliss Company should be willing to make at a moderate cost.

Service tests with such a torpedo should demonstrate conclusively whether or not it is an improvement over the Whitehead torpedo.

A torpedo containing the Curtis turbine, the Leavitt superheater, and the new adjustable gyroscopic steering gear would be essentially an American torpedo and could not properly be called a Whitehead.

Very respectfully,

G. C. DAVISON,
Lieutenant, U. S. Navy.
K. W.

Chief of Bureau of Ordnance.

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DEFENDANT'S EXHIBIT 131.

Address Bureau of Ordnance, Navy Department, and Refer to No. 5011.

Department of the Navy,
Bureau of Ordnance.

WASHINGTON, D. C., September 3, 1902.

SIR: 1. The Bureau has been furnished with the following information:

The Bliss Co. has well under way a turbine torpedo which they

propose to submit to the Bureau when completed. The turbine is similar to the experimental turbine. The exhaust will be through the after-body and tail shaft. The after-body has less taper, i. e., is larger at the tail end on account of the increased diameter of the shaft. This gives an exhaust 3-inches in diameter.

2. Mr. Leavitt has a new design for every auxiliary in the torpedo with the exception of the driving gear. The starting lever is done away with. The pressure in the tube when the torpedo is fired acts on a diaphragm and operates a valve admitting air to the turbine. The water tripper is omitted on the assumption that the turbine may race without injury. He has designed and uses a gyroscope worked by a jet of air on a wheel. This is probably a modified Kaselowski gear. The Bliss Co. hopes to have this turbine torpedo ready for trial October 1st.

3. In this connection the Bureau would like to be informed as to what progress has been made in arranging the turbine to run as directed by the Bureau.

Respectfully,

CHARLES O'NEIL,
Chief of Bureau of Ordnance.

Inspector of Ordnance, in charge Naval Torpedo Station, Newport, R. I.

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DEFENDANT'S EXHIBIT 132.

BOROUGH OF BROOKLYN, NEW YORK, September 15, 1903.

SIR: We beg to advise you that we have developed a new torpedo differing in many important details with the Whitehead or any other torpedo known to us, and for which we claim much greater speed and longer range than the Whitehead, as well as many other improvements. A turbine engine is used, superheated air, a new gyroscopic steering arrangement (instead of the Obry gear), new locking gear for the horizontal rudders and other new features.

We have made a series of tests of this torpedo at Sag Harbor, N. Y., which appear to us to be so satisfactory that we desire to submit a torpedo to the United States Government for its consideration. We therefore most cordially invite you to be present, if possible, and to send a Board of officers to Sag Harbor, N. Y., to witness such tests of this torpedo as you and the Board desire to have made and to make an official report of the same to the Navy Department.

We are now ready to commence such tests, and would be pleased to do — at as early a date as is agreeable to you and as is convenient to have the Board at Sag Harbor for that purpose.

We would request that you and the Board keep the information we will lay before you, and the tests of this torpedo, confidential, as some of the patents applied for have not yet been issued.

Trusting we may have the pleasure of your presence at that time, we remain,

Very respectfully,

E. W. BLISS CO.
W. S. PORTER,
Vice-President.

488 To Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Through Inspector of Ordnance, Works of E. W. Bliss Co., Adams & Plymouth Streets, Borough of Brooklyn, N. Y.

DEFENDANT'S EXHIBIT 133.

U. S. NAVAL TORPEDO STATION,
NEWPORT, R. I., October 13, 1903.

SIR: The Board assembled at Sag Harbor on September 22nd, 1903, and there witnessed the trials of this torpedo at 1200 yards range. The results are appended marked "A". After the first five shots, the Board agreed to accept the results of those shots as demonstrating the speed of the torpedo at that range; the reliability of the mechanism for controlling the torpedo throughout its dive and run, and the facility with which it could be charged, adjusted and discharged. The speed at 1200 yards is, therefore, regarded as 30.85 knots.

The Board was not satisfied with the accuracy of the runs, it being apparent that the gyroscopic steering gear needed readjustment. Mr. Leavitt, the inventor, claimed that over 100 shots had been fired without any readjustment.

The remainder of the shots during September 23rd and 24th were made for the purpose of correcting this adjustment, of determining the speed without superheater at 1200 yards, and
489 the maximum speed obtainable at 800 yards with and without superheater. The runs made at 1200 yards without superheater gave a maximum speed of 22.3 knots, which was regarded as satisfactory, but the runs at 800 yards with superheater gave a maximum of 36.67 knots, which was not considered satisfactory and 29.15 knots without superheater, which was considered satisfactory. The Bliss Company then requested a suspension of the trials (reasons on Appendix "A").

The Board again assembled at the Bliss Company's Works at Brooklyn at 9 A. M., September 29th, at which place the torpedo was inspected while completely disassembled; the drawings were also examined and all parts were explained by Mr. Leavitt.

* * * * *

In order to test the torpedo for accuracy at 800 yards and the control of the torpedo by the gyroscope after it had been cleaned and put in proper condition, and, also, to satisfy the Board as to the accuracy of the torpedo when launched abeam from a torpedo boat at high speed, the Bliss Company agreed to send the torpedo

to Newport, at which place the Board assembled at 10 A. M., October 8th, 1903.

The torpedo having arrived at about 10 A. M., was assembled, filled with air and tested in the shop. It was found that the ratchet wheel of the steering motor would not stop when the pawls encountered the blank spaces. This was due to the change made in the drive of the cams by which the pawls having been given greater angular motion engaged two teeth at a time, the blank spaces covered two teeth only. The remedy was to file away one tooth adjoining the blank spaces. The day was consumed in assembling, adjusting and preparing for a trial run.

490 The weather on October 9th was too rough to make a satisfactory run, considering the nature of the observations to be made, and the care advisable in handling the only torpedo of its kind in existence, but the torpedo was placed in the tube on board the "Morris" preparatory to taking advantage of the first lull in the weather. The Board went out to the target range on board the "Morris" on October 10th, but the weather continued unfavorable in fact the conditions for firing were worse and continued to grow worse throughout the day.

The torpedo however was transported back to the assembling room and placed upon the rotating stand for test of its steering gear, which was then found deranged. Mr. Leavitt and a machinist from the Bliss Works spent a good part of the following day, Sunday, in investigating the cause. The insulation of one of the solenoids was found defective and this solenoid was readily rewound at this station.

On Monday the weather was still bad and it was not till Tuesday afternoon that the torpedo was fired. One shot was fired from the torpedo boat stationary, and this demonstrated that the gyroscope controlled the torpedo accurately.

On Wednesday three shots were fired from the "Morris" under full speed (20 knots) with the tube trained abeam. Accurate depth curves for the last two shots were obtained. The last shot was a "bull's eye" and the dive was deep with a gradual rise to set depth. The fact that no sharp undulations appeared in the trajectory, indicates that, for this run, at least, no evil effect was manifested by the gyroscopic energy of the torpedo. The control of the gyroscope was complete and the Board, therefore, decided to cease trials and make its report to the Department.

491 Brief Description of the Leavitt Turbine Engine.

The turbine is of the Curtis type, now being extensively adopted for rotating electric motors.

Two steel discs about $1\frac{1}{4}$ " thick and set about $1\frac{1}{4}$ " apart are set to revolve in the after body, their common axis coinciding with the longitudinal axis of the torpedo. Their forward bearing is on the forward bulkhead of the after body and their after bearing on a frame abaft this bulkhead. The frame also supports the bearing of the main shaft and the gear nuts and can be readily dismounted. Curved air passages (reversed curves) are cut across

the edges of the discs and across a short section of the steel which is secured to the shell of the after body at the bottom of the torpedo and opposite to a casting having four holes or nozzles, to which the air pipes from the starting gear is joined. The air from the flask reaches these nozzles through the valve system at reduced pressure. After doing its work by passing through the ports of the turbine, the air flows into the after body and out through the hollow shafting of the tail, forcing open a valve in the tail shafting. This valve, at the end of the run, automatically closes by means of a spring and the pressure of the water outside.

The turbine discs are geared to the main shaft and make seven revolutions to one of the shaft.

During the trials at 1200 yards, one of the nozzles was blanked off and air was expended through three only. At the 800 yard range all four nozzles were in operation, so that the reservoir of air could be more rapidly expended, developing a higher speed at a shorter range.

No distance gear is provided, but the distance for practice shots may be shortened by pumping a smaller quantity of air into the flask.

492

The Superheater.

This consist of a heater-pot open at the top, placed within the air flask, in which alcohol is caused to burn during the run of the torpedo; of a feeding mechanism for supplying the liquid at a uniform rate throughout the run, and of an igniting device for igniting the alcohol at the instant of launching.

The Feeding Apparatus.

Within the immersion chamber a reservoir for the alcohol is placed.

* * * * *

The Igniting Device.

The alcohol is ignited in the heater pot at the instant of launching by means of a smokeless powder fuse, which, itself, is ignited by an ordinary percussion cap, a small wad of "soluble cotton" being placed at the upper end to take the flash from the cap.

* * * * *

The Starting Valve.

In place of the bent lever used in the Whitehead for starting, this valve is operated by the pressure in the launching tube acting against a diaphragm. The diaphragm consists of a thin corrugated disc of copper soldered at the edges over a cavity about $\frac{1}{4}$ " deep. Within this cavity is a loosely fitting piston acted upon by the diaphragm and pressing against a pin in the center.

The pin bears against a small cross valve, held on its seat by air, in free communication with the upper side of the main starting

valve. The only communication between air passages and the space above the main valve is around the surface of the latter, or, in other words, leakage past the piston. When the diaphragm receives a pressure, it opens the small cross valve which allows air to exhaust from above the main valve. The latter is, therefore, forced wide open by the pressure of air from the flask. It is provided with a seat on its upper face to prevent leakage of air during the run of the torpedo.

As the small cross valve is held open by the diaphragm for an instant only, a small wedge is inserted in such a way as to hold it open when the main valve is open, in order that the main valve may not fly shut again. When the pressure in the flask has been reduced to a desired amount at the end of the run, the main valve is closed by a spring which pulls it shut. As before noted, no other distance gear is provided.

This diaphragm operates well with torpedoes discharged above water, and should work with the submerged tube, the pressures being approximately the same in both cases.

* * * * *

Depth Controlling Mechanism.

This is the same in principle as that in the Whitehead, but the steering engine and locking gear are modified to conform to the space available. In order that the horizontal steering rod may clear the turbine, it is necessary to move the steering engine further from the centre of the torpedo than in the Whitehead. In order to use the old pendulum gear without change, a rock shaft is introduced to transmit motion from the pendulum to the steering engine valve. Two arms extend downward from this rock shaft, one of which connects to the pendulum gear and the other to the steering engine valve. One of the arms is constructed with an adjustment

operated by a star wheel. A pointer indicates its position.

This arrangement corresponds with that used in the Mark I (3.55 meter) for lengthening or shortening the valve stem. It has been found awkward to operate this star wheel in practice and it should be arranged to carry the adjusting nut and scale to the shell of the torpedo. Mr. Leavitt agrees that this may be readily done by adding a small worm and pinion operated by a small shaft carried to the shell.

The device for locking the valve consists of a traveling bar which is pressed by a spring against two horns on the rock shaft, thus locking the rock shaft in a fixed position. The forward end of the locking bar is pivoted to a slide against which the spring acts. The after end is provided with a jaw which slides over an eccentric, acting as a guide bearing. By rotating this eccentric, one way or the other, the locking bar may be tilted up or down, so as to lock the valve in any desired position. Attached to the eccentric is an index to indicate the position of locking.

In order to unlock the valve, a cylinder is provided, which takes air from the main air pipe, and is pressed forward against a bent

lever, the piston being held stationary. At the forward end of the stroke the locking bar is pushed back, but this forward movement of the unlocking cylinder is retarded by a rack attached to it which meshes with a pinion. This pinion is geared to the main engine, the revolutions of which thus regulate the rate of forward travel. As the cylinder must stop at the end of its stroke, and the gearing continues to revolve as long as the main engine is running, a ratchet and wheel are inserted in one of the gears to allow this to take place.

To lock the device it is necessary only to push back the locking
495 cylinder as far as it will go. To vary the duration of locking, a stop nut is provided which can be set so as to allow the cylinder to be pushed back a greater or less distance, as desired. This nut is geared to an indicator which shows the duration of locking.

The steering engine differs from that in the Whitehead simply in details of construction. In order to get it into shorter space the piston is made rigid, and the rudder rod is attached to the cylinder. The cylinder and not the piston moves with the steering rod. A scale is attached to the cylinder, which shows the corresponding position of the rudder. After connecting up the rudder rod it is necessary to see that the rudder is horizontal when the mark on the cylinder stands at zero on the scale.

* * * * *

The Leavitt Gyroscopic Steering Gear.

The gyroscope receives its impulse from an air blast at flask pressure at the instant of discharge. Pelton wheel buckets are cut in the rim of the gyroscope. The air is admitted and cut off by an automatic piston valve and the cut off movement operates to withdraw another valve, having on one end a centering pin (to hold the gyroscope in mid-position) and on the other a rod which moves a spring-controlled clutch to hold the valve and centering pin forward after the gyroscope is spun. No automatic centering or position gear is provided, the operation of centering being performed by hand when preparing for a shot, at which time the gyroscope is held in position and the clutch released by hand, allowing the centering pin to go into position by the pressure of the clutch
496 spring.

The gyroscope spins upon pivot-point bearings and its vertical ring is in electric connection with one pole of a dry battery. This ring bears a projecting arm with silvered top which slides over the flat poles of a solenoid also connected with the battery. An insulated strip on the midship line separates the two poles of the solenoids, so that when the projecting arm on the gyroscope ring passes over one of the poles of the solenoid, one arm of the electro-magnet is attracted to that pole and moves a finger which lifts one of two pawls, the function of which is to revolve a ratchet wheel.

These pawls obtain their vibrating motion from a cam which is rotated by being geared to the main shafting.

The ratchet wheel carries an eccentric which in its revolution

moves the vertical rudder steering rod in or out, thus giving hard over helm on either side.

The pawl that is lifted is prevented from revolving the ratchet wheel but the other pawl revolves the wheel to the proper position for hard over helm on one side, when it encounters a blank space on the ratchet wheel and the revolution of the wheel stops, thus holding the helm hard over. The ratchet wheel is held in position by other pawls pinned to a fixed base in the torpedo. When the gyroscope arm moves across the insulating strip to the other pole, the other pawl is dropped, the first one is lifted and the ratchet wheel is revolved in the same way until the helm is hard over on the other side. Should the electric magnet fail to operate for any reason, the pawls would continue to revolve the ratchet wheel continuously and the helm would move continuously from one side to the other.

497 The torpedo would then run a course approximately straight, much the same way that it would run if no gyroscopic steering gear were provided, except that the course would be sinuous.

If the gyroscope should fail to run and get jammed in any way off the neutral line, the torpedo would make the dangerous full circle, but it would not make this circle through any ordinary defect of the power moving the steering rod, as would happen in the air steering device now in use should its valve get jammed by a particle of grit.

If one of the springs holding either pawl down to its work were to break, the torpedo might possibly make the dangerous full circle, but this is regarded as a remote possibility, and less likely to occur than the jamming of the rudder hard over by grit in the air passage, as might occur with an air-controlled steering gear.

It is thus seen that the principal difference between this gear and the other gears now in use is the substitution of mechanical power obtained from the shaft for moving the vertical rudders instead of an air piston and the controlling of this power from the gyroscope by means of a moving electrical contact instead of a delicately balanced air valve.

The combined apparatus, including the electric battery, weighs more than either the Mark I or Mark II gyroscopic steering gear, but this disadvantage is offset by the fact that it is less liable to cause the torpedo to make a dangerous full circle.

A prime source of trouble with electric devices is the uncertainty of continuity of circuit due to numerous wire connections. There is too much wire used in this device as at present installed, but this may be improved and by better insulation the apparatus
498 rendered more compact and certain in an entirely new torpedo.

In its present shape, it cannot be set to steer the torpedo to turn through a predetermined angle before running straight; but by a very simple change it can be made to turn through any angle, within 170 degrees on either side of the tube axis. It is thought that the gear should be so fitted. It was not possible to set the gear in an improvised way to make a curved run, in order to test the

effect of the gyroscopic energy of the turbine upon the steering when using wide angle fire, but it is thought that this will be readily controlled by the steering device under all circumstances. Nevertheless, there is sufficient doubt about it to defer the purchase of torpedoes in quantity until the question is fully settled.

If the torpedo is inclined to run straight (with the gyroscope arm resting on the insulated strip on midship line) it cannot do so because the helm will act from hard over one side to hard over on the other only. But by the introduction of a third pawl between the two others on the ratchet wheel to act when both the others are lifted (through action of the springs which rotate the lifting finger to mid-position when both poles of the solenoid release it) the helm may be brought to midship position and the sinuosities of the course gradually flattened out, as is done by the automatic valve of the Mark II gyroscopic steering gear.

The novel features of this torpedo, their advantages and disadvantages, may be summarized as follows:

499

A. The Turbine Engine.

Its principal advantages are:

1. Simplicity which makes it easier to manufacture, overhaul, understand and care for. The casting of the cylinders and air spaces of the reciprocating engine is so difficult that snags have been found in them even after acceptance. Another advantage of the turbine is, therefore:

2. Reliability or certainty of action. There are furthermore no dead centers to this engine.

3. Strength. The trials of the reciprocating engine with the superheater device in the 5 meter torpedo of the Whitehead have demonstrated that the limits of strength have been reached. Greater speed is desired and the turbine renders this possible of achievement without great sacrifice of weight.

4. Durability. No lubricant is necessary for the engine proper. The turbine of the torpedo under trial having been fired over 200 times showed absolutely no signs of wear or deterioration.

5. Greater speed. Being better adapted for unlimited increase of pressure, it is more suitable for use with the superheater and it, therefore, is better adapted for increase of speed. There is also less friction of parts to overcome.

6. Increased range. After the air is exhausted from the flask, the revolutions of the turbine (its gyroscopic energy) carry the torpedo 100 yards or more beyond the range of a reciprocating engine.

7. Less chance of loss. An error sometimes made in discharging torpedoes is to leave the propeller lock on. If the torpedo has negative buoyancy, with the propeller lock on, it will sink. With a turbine torpedo the air continues to escape and regaining its buoyancy will rise to the surface.

500

Its advantages are:

1. Want of control, or the lack of facilities for ready adjustment to run at different speeds and distances. To get the best work

out of a turbine it should be designed to obtain the best speed throughout the range limited by the power contained in the flask. The torpedo may be designed to run with all its nozzles open for a shorter range or with one or more of the nozzles blanked off for a longer range, but the latter expedient is not getting the best work out of the mechanism for the range at which the torpedo is designed to run normally.

All war shots would probably be run at maximum range for which the torpedo is designed and shorter practice runs can be made in a good practical way by charging the flask with air sufficient for the run and no more. If therefore, we design two classes of torpedoes, one for the use on boats and destroyers (over water discharge) with a maximum range of 1200 to 1500 yards, and another for use on ships intended for the line of battle (submerged discharge) with a maximum range of 2500 to 3500 yards, the disadvantages of the turbine in this respect is entirely offset by its advantages.

2. Gyroscopic action of turbine. In this torpedo the turbine revolves about an axis coinciding with that of the torpedo. An effort on the vertical rudders should cause the torpedo to dive or rise. An effort on the horizontal rudders should tend to cause the torpedo to swerve to right or left. As the torpedo makes a sinuous course during a run, any tendency of the gyroscopic energy of the turbine to disturb its accuracy should be apparent during a run. During the trials at Sag Harbor and Newport, the torpedo seemed to be under perfect control and accurate, and apparently the gyroscopic energy of the turbine did not disturb the accuracy. It is impossible to say whether any greater disturbances would be produced during a curved run with wide angle fire, as the gear as at present arranged would not permit of such a run. If, however, in future trials, such a disturbance should be experienced, a feasible and practicable remedy would be to substitute for the one turbine a pair of twin turbines revolving in opposite directions, geared together and to the main shaft.

B. The Superheater.

The advantages are:

1. Increase of speed. The increase of 1200 yards, in the recent trials at Sag Harbor, as 8.55 knots.
2. Greater range. For the same speed and capacity of flask, the range is increased approximately one half.
3. Avoidance of freezing. Without the superheater, the expansion of air, in the air passages causes the formation of ice.

Its disadvantages are:

1. Increased complication. Anything added to an already complicated machine is of course a disadvantage, but the increase of speed or range is desirable even at this sacrifice.
2. Requires an open end flask. The desirability of the open end flask for purposes of inspection and preservation from rust render it advisable, even when superheaters are not used.
3. Greater care required in handling the alcohol and the smoke-

less powder fuses. This is somewhat counterbalanced by the decreased care necessary, in other parts of the torpedo.

4. Requires empty flask to adjust. This is not a serious objection when considered in connection with the absence of distance gear. The flask will be practically empty at the end of each run, and the superheater can readily be charged and primed before charging the flask. The use of air for making adjustments after the flash is charged, as noted under head of retarding valves, is possible.

C. The Starting Gear.

The advantages of this arrangement are:

* * * * *

D. The Retarding Gear.

* * * * *

E. The Depth Controlling Mechanism and Arrangement of Parts.

The advantages of this arrangement are:

1. Simplicity.

2. Handiness, or facility for overhauling and repairing. The starting, reducing and retarding valves being separated from the valve group, the whole system of valves is spread out in plain view over the immersion chamber bulkhead so that each can be got at separately or together. The adjustments can readily be made with the after body removed, or from the side of the torpedo with after body in place.

The only disadvantage is that the rudder diaphragm of the hydrostatic piston is partially obscured and cannot be removed without removing all of these valves. This is not a serious objection but it may be made less objectionable by the substitution of a thin corrugated copper diaphragm, such as is used in the Schwartzkopf torpedo.

503

F. The Gyroscopic Steering Gear.

The advantages are:

1. Positive mechanical power for working the vertical steering rod by gearing from the shaft.

2. Simplicity in doing away with positive gear, although this might also be done with any steering gear. This, however, seems to be the first time it has been suggested.

3. Decreased Danger. It eliminates the danger of a full circle run caused by obstruction in the air passages of the delicate control valve, although this danger from other causes is not entirely removed.

The disadvantages of this gear are:

1. Increased complication. It requires the use and care of an electric battery. This battery is not now arranged for convenient

test, but it can and should be arranged to be readily tested for activity and continuity of circuit before each run. It should also be capable of being quickly replaced, and the electric connections should be more compact and certain.

2. Increased weight. The combined apparatus weighs somewhat more than other gyroscopic steering gears, but as the weight is not excessive and is placed mostly below the shaft, the objection is not serious.

3. No wide angle fire. In its present shape it cannot be set to steer the torpedo through a predetermined angle before running straight; but by a very simple change it can be made to turn the torpedo through any angle up to 170 degrees on either side of the tube axis. The gear should be so fitted whether the wide angle fire be used or not.

4. Helm always hard over. Like the original Obry, the helm is always hard over one way or the other, unless the battery fails to work, when the rudders will vibrate between the hard over positions both sides. By the introduction of a third pawl to bring the helm amidships when the contact point is on the insulating strip. It is thought the sinuosities of the run may be flattened out in the same manner as when using gyroscopic steering gear Mark II.

* * * * *

G. The Distance Gear.

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H. Shape of Torpedo.

The lines of the after body are of necessity somewhat fuller than usual, owing to the enlarged section of the tail shafting to permit of free discharge of air from the after body.

It is not so serious as to cause marked deficiency in speed or steering power, but it does increase the buoyancy of the after body and it strengthens the tail considerably. It also enlarges the hubs of the propellers and adds to their strength, a factor which requires careful consideration when designing torpedoes for higher speeds.

The torpedo under trial was an improvisation, the flask being one of the 5 meter, Mark II type, while the after body, requiring larger capacity than the one designed for that flask, bulged out considerably abaft the joint ring and thus deprived the torpedo of fair lines. This want of fairness in the lines must have worked harmfully against the speed of the torpedo. In other words, the speed of a new torpedo, of the same capacity as this one, designed throughout for the use of the turbine engine, would exceed that shown on the trials. It is impossible to calculate how much, it is thought that 31 to 32 knots would be attained at 1200 yards.

It is not to be understood, however, that the turbine gives a great increase of speed over the reciprocating engine. The increase is very small, due to the fact that the speed of the turbine must be geared down to the shaft, by which it loses about 5 per cent. of its efficiency, but the turbine permits the increase to much higher speeds in the torpedo because of its greater strength and simplicity.

Conclusions and Recommendations.

The Board finds that the turbine torpedo under trial has an average speed of 30.25 knots at 1200-yard range, which, considering the improvised character of the work and the novelty of many parts, is a remarkable performance. An entirely new torpedo with all parts arranged to the best advantage would, doubtless, give better speed and more satisfactory results.

The superheater device gives great advantages in speed and range. The increased complication incident to its use is more than offset by its advantages. It can profitably be applied to the torpedoes now in use to increase their range, if the speed be limited to that for which their engines are designed.

The new arrangement of valves for starting and controlling the torpedo is an improvement over that in the Whitehead and
506 with a few minor changes that can be readily made as noted in the report, will be entirely worthy of adoption.

The torpedo under control of the gyroscopic steering device is as accurate as the Whitehead during the straight runs and is comparatively more reliable than the air controlled gyroscope from the fact that the motor for moving the vertical rudders is a positive mechanical device, free from the possibility of danger from particles of grit in the air passages.

The inconvenience of requiring an electric battery for its control is not a serious objection, provided the correct insulation of the circuit be assured. Two hundred and five shots have been made with this device, according to the makers, without ever having a full circle, but the device should be subjected to comparative tests with other devices, entirely by the Government and under service conditions.

No opportunities have been given for testing this device with wide angle fire, but it may readily be rigged for such firing. The only question of doubt apparently is the possibility of accurately controlling the turbine torpedo (after the turbine has been fully spun up) under wide angle fire.

The absence of distance gear is unqualifiedly commended.

The turbine engine is more efficient than the reciprocating engine for attaining the desired speed and range, and it is much simpler and stronger. To get the best performance from this engine, however, the torpedo should be designed for a maximum speed at a predetermined range within the limits of the dimensions allowed. This points directly to the design of two classes of torpedoes, one for boats and the other for ships in the line of battle, the one
507 being a high speed torpedo for moderate ranges and comparatively light; the other a long range torpedo with the highest speed for the desired range, the dimensions to be arranged accordingly.

We recommend the purchase of two torpedoes, one each of two distinct types, one type designed for over water discharge from torpedo boats and destroyers, and limited for discharge from the 5 meter tubes now in use and to develop the highest possible speed at a

range of 1200 yards. The other type to be designed to cover a range within the practical limits of accuracy and penetration of the heavy guns now in use on the heaviest armor now in use. This range in the opinion of the Board would probably be about 3,000 yards. The latter torpedo to be designed for submerged discharge and to attain the highest possible speed for that range. These two types of torpedoes to be designed with all parts of engines and valve mechanisms interchangeable as far as practicable.

The Board believes that an initial flask pressure of 2250 lbs. for both types is practicable, and recommends that this pressure at least should be used, but it does not wish to assume that this pressure is a final limit to the pressures that may ultimately be used.

The Board also believes that the superheater may profitably be applied to the 5 meter torpedoes now in use on battleships to increase their range; in other words, to obtain the speed they now give for 800 yards for a range of 1200 yards, or to obtain the speed they now give at 1600 yards for a range of 2400 yards.

Very respectfully,

W. IRVING CHAMBERS,
Lieut. Commander, U. S. N.
W. J. SEARS,
Lieut. Commander, U. S. N.
F. K. HILL,
Lieutenant, U. S. N.

The Chief of Bureau of Ordnance.

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COMPLAINANT'S EXHIBIT 26.

The E. W. Bliss Company,
Offices: Adams and Plymouth Streets, Borough of Brooklyn, New York.

NOVEMBER 4, 1903.

SIR: We beg to acknowledge receipt of your letter 12865 of the 2nd instant, with copy of proposed contract and specifications, together with general characteristics of Bliss-Leavitt Mark III torpedoes.

We respectfully request that the following changes be made:

1. In 5th line of contract, change "President" to "Vice-President."
2. Page 4 of contract, line 12, "devision" should read "decision."
3. Tenth clause: In our verbal agreement as to the general features of this contract, the subject matter of this clause was not discussed and we do not feel that we can agree to it. If the Navy Department wishes to obtain sole control of the Bliss-Leavitt torpedo, we shall be pleased to offer it at a fair valuation.
4. In clause 18 of the specifications, we would suggest that the word "Obry" be changed to "gyroscope."

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9. The last line of section "h" of the same clause should read "1200 yds." instead of "800 yds."

Respectfully,

E. W. BLISS Co,
W. A. PORTER,
Vice-President.

509 To Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Through Inspector of Ordnance, U. S. N., At Works of E. W. Bliss Co., Adams & Plymouth Streets, Brooklyn, N. Y.

COMPLAINANT'S EXHIBIT 25.

Address Bureau of Ordnance Navy Department, and refer to No. 13102.

Enclosure.

DEPARTMENT OF THE NAVY,
BUREAU OF ORDNANCE,
WASHINGTON, D. C., November 7, 1903.

SIRS: Referring to your letter of November 4th, 1903, suggesting a certain number of changes to be made in the contract forwarded by the Bureau for the manufacture of Bliss-Leavitt 5-meter, 45-centimeter, Mark III, torpedo:

1. The Bureau agrees to the changes as suggested with the exception of the one contained in par. 6. The Bureau does not wish to reduce the thickness of the flasks or to increase the working pressure above 2250 lbs.

2. In regard to par. 10 of the contract, the Bureau agrees to omit this at the present time, the same to be open to discussion and agreement between the Bureau and the E. W. Bliss Company in the future.

3. The Bureau forwards herewith a copy of contract agreeing to your suggestions and the Bureau's agreements, and if this copy of contract and specifications is agreeable to you, you may consider the contract as closed.

Respectfully,

CHARLES O'NEIL,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 24.

E. W. Bliss Co.,

Offices: Adams and Plymouth Streets, Borough of Brooklyn, New York.

April 21, 1904.

SIR: We yesterday requested Messrs. Herbert & Micou to consult with you in regard to our Government's retaining the sole control of the Bliss-Leavitt torpedo. They advise us that you suggest we write the Bureau in regard to the matter, and refer to "clause ten of the contract."

In the original draft of the contract, a clause ten was inserted by the Bureau which provided that we should refrain from supplying torpedoes to foreign Governments. In our letter of November 4, 1903, to the Bureau, we said at paragraph 3, "Tenth clause; In our verbal agreement as to the general features of this contract, the subject matter of this clause was not discussed, and we do not feel that we can agree to it. If the Navy Department wishes to obtain sole control of the Bliss-Leavitt torpedo, we shall be pleased to offer it at a fair valuation." The Bureau thereupon omitted this clause from the contract, at the same time, in letter No. 13,102 of November 7, 1903, requesting that the matter be left open to discussion and agreement in the future.

We are placed in a somewhat embarrassing position between our desire to defer to the wishes of our own Government and our business interests which point abroad.

In the manufacture of the Whitehead, we were limited to dealing with our own Government, but with our own torpedo we could deal with all the nations of the world.

We have been approached by a number of interests, having large dealings with foreign governments, and there is little doubt that we could quickly make connections which would lead to very large business. We would gladly give the sole control of the torpedo to our own Government for a consideration far less than we believe could be realized from its general sale abroad, but we believe it has never been the policy of Congress to buy sole rights in war material, and we presume that in a case of the magnitude of this one, it could only be done by act of Congress.

Foreign matters, however, are pressing, and in justice to ourselves we cannot afford to maintain a dilatory position or await the slow and uncertain action of Congress. We would, therefore, respectfully request that we be informed if there is any way the matter can be adjusted without going to Congress. On the other hand, we would be glad to receive the Bureau's approval of our opening negotiations with other governments.

Respectfully,

E. W. BLISS CO.,
W. A. PORTER,*Vice-President.*

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

COMPLAINANT'S EXHIBIT 23.

Address Bureau of Ordnance, Navy Department, and refer to No. 4647. E.S.B.-A.

DEPARTMENT OF THE NAVY,
BUREAU OF ORDNANCE,
WASHINGTON, D. C., April 28, 1904.

SIRS: Referring to your letter of the 21st instant, in regard to the Government retaining the sole control of the Bliss-Leavitt torpedo:

1. The Bureau has this matter under careful consideration and wishes to settle the same one way or the other at the earliest practicable date; and in order to aid it in the discussion of the subject, it would be pleased to know what patents, if any, you have secured for this device, both in the United States and in Europe, giving the numbers and dates of the same, if possible.

2. An early reply will be greatly appreciated.

Respectfully,

G. A. CONVERSE,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 22.

Address Bureau of Ordnance, Navy Department, and refer to No. 4647.

DEPARTMENT OF THE NAVY,
BUREAU OF ORDNANCE,
WASHINGTON, D. C., May 28, 1904.

SIR: Referring to your letter of the 21st ultimo, and a letter of the 27th ultimo, addressed to Messrs. Herbert & Micou, and by them forwarded to this Bureau, in regard to the value of certain torpedo patents and rights:

1. This Bureau, after careful investigation of this subject, does not deem it advisable to purchase all the rights, foreign and domestic, pertaining to the Bliss-Leavitt torpedo, on account of the publicity already given this design and the impracticability of maintaining any secrecy with regard to such matters, when so many must be party to the secret.

2. This Bureau is desirous of developing in this country works for the manufacture of torpedo appliances of all kinds that will be the equal, if not superior, to any similar works in any other country; this to the commercial advantage of such company or companies, and the military advantage of this Government. The development of such works can best be obtained by contracts that will warrant it, and by fair dealing with the Government. In this connection

it may be stated that for ships already appropriated for and now actually building, there are required torpedo outfits valued in the aggregate at over two and a half million dollars (\$2,500,000.00), which does not include spare parts and spare torpedoes, or reserve appliances. The cost of the torpedo outfits herein alluded to

514 does not include the possibility of an improved under-water launching apparatus, which this Bureau is desirous of developing also; and the installation of four or more of such appliances on each armored cruiser or battleship would represent the expenditure of several hundred thousand dollars more.

3. Commercial advantage is obtained by large contracts that allow of expension, and by improved quality and quantity of the manufactured products that insure successful competition in the world's markets.

Marked improvements in the design of a torpedo, that increase materially its war value, create a demand for it, but they should be submitted, first, to the Government that has been the material means to such a development.

4. In view of the above facts, this Bureau is ready to consider propositions for entering into contracts at once with your Company, or any reliable company, to furnish the torpedo material above enumerated, or any portion thereof, for the vessels now building, provided; first, that such company agrees to the usual requirements of Government contracts; second, that such company agrees not to dispose of any exclusive rights to, or patents upon, torpedoes or their appliances, which that company now controls, to any foreign government; third, that such company agrees that any improvements in the type or design of torpedoes or their appliances which it may in the future develop or obtain control of shall be held secret and submitted to this Government to be passed upon before being offered to the markets of the world, and further, that the exclusive control of such improvements shall be the subject of negotiations as the occasions may arise; fourth, that having agreed to the foregoing conditions such company be unrestricted in the solicitation of
515 orders from other countries; fifth, that such company agrees to endeavor to develop their works in order that they may be of the greatest military value to this Government, consistent with fair manufacturer's profit and commercial success.

5. If, upon consideration of this subject as herein outlined, your company so desires, this Bureau is willing to proceed with further negotiations.

Respectfully,

G. A. CONVERSE,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 21.

BUREAU OF ORDNANCE,
NAVY DEPARTMENT,
WASHINGTON, D. C., Oct. 16, 1905.

N. 17761/43 (G).

SIR: 1. The Bureau desires to present for your consideration certain points in regard to the development of the Bliss-Leavitt torpedoes.

2. This torpedo, the invention of Mr. Leavitt, is as the Bureau understands it in effect, the property of the Bliss Co. In negotiating with you for its use by the United States Navy various reasons existed which prevented the Bureau from obtaining from you the exclusive right to the use of this particular weapon. The Board

therefore understands that you are entitled to make such sales
510. of these torpedoes or of the rights thereto to such foreign governments as you may see fit. Comprehending this fact clearly, and not being desirous of being unnecessarily strict, the Bureau has so far interposed no objection to your exhibiting to foreigners torpedoes which you are building under the present contracts. While the Bureau believes that it would be within its rights in advancing such an objection it has not cared to force you to the expense of building torpedoes of your own for this purpose, and therefore has not raised the point.

3. There now arises a further extension of this point however. The situation being as above set forth, the Bureau now intends to use the skill and experience of its officers and others, and to expend a certain amount of money in perfecting certain features of the torpedo. While it is desirous of doing this, and of giving you the benefits of its discoveries, should any of value be made, in order that you may use them in filling contracts entered into between you and the United States Government, at the same time it would not be right for you to make use of knowledge thus gained at the expense of the United States and by work of its officers to benefit foreign governments, possible adversaries of the United States in time of war, or for the financial or other gain of the Bliss Co.

4. The Bureau asks that you consider this question most thoroughly, and is confident that you will admit the justice of the contention.

5. It seems to the Bureau that it might be possible to so far frame a clause in the contract as to guarantee to you the use of all knowledge and experience gained by the Bureau, provided that you in turn guarantee that such knowledge and experience shall be used
only in fulfilling contracts with the Bureau.

517 6. A prompt reply is requested, in order that the signing of the pending contract may not be delayed.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Co.

(Through Naval Inspector of Ordnance.)

COMPLAINANT'S EXHIBIT 59.

BUREAU OF ORDNANCE,
NAVY DEPARTMENT,
WASHINGTON, D. C., October 18, 1905.

No. 17761/41(G).

SIR: Referring to the question of the balancing of rudders in the 21" Mark torpedoes:

1. The Bureau is informed by Naval Constructor D. W. Taylor, U. S. N., that the theoretical perfect balance for a rudder of zero thickness is when only two-tenths (0.2) of its area is forward of the rudder post, this post being of zero diameter.

2. That officer is of the opinion that, with such thin blades as are found in the tail blades of a torpedo, the rudders may be overbalanced when one-quarter ($\frac{1}{4}$) of the area is forward of the post.

Respectfully,

Chief of Bureau of Ordnance.

The E. W. Bliss Co.

(Through Inspector of Ordnance in Charge.)

518

COMPLAINANT'S EXHIBIT 20.

E. W. Bliss Co.,

Offices: Adams and Plymouth Streets,

BOROUGH OF BROOKLYN, NEW YORK, Oct. 19, 1905.

SIR: In reply to your letter No. 17761/43 of the 16th inst., we beg to say that we fully appreciate the justice of the position taken by the Bureau, and we shall always hold as strictly confidential, and as the sole property of the Bureau, any improvements in the torpedo suggested by it.

We believe, however, that the Bureau will agree with us that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the suggestion of a possible improvement is made by the Bureau and worked out by us.

As this is a very important matter, and as we wish to be very careful not to divulge anything which the Bureau considers its private property, and to have no misunderstanding as to where the line shall be drawn, we mention the following as an illustration of our position.

The Bureau found fault with our starting mechanism and wanted something simpler and requiring less attention. If the Bureau had suggested the use of a breaking tube, this device would clearly have been its sole property. But as a matter of fact, although it was the Bureau's suggestion that a simpler device be substituted, as we

worked out the manner of its accomplishment, we feel it to be our property.

519 We should be pleased to be informed if this view of the case meets with the Bureau's approval.

Respectfully,

E. W. BLISS CO.

F. M. LEAVITT.

To Chief of Bureau of Ordnance, Navy Dept., Washington, D. C.
Through Inspector of Ordnance, U. S. N., Works of E. W. Bliss Co.,
17 Adams St. Brooklyn, N. Y.

COMPLAINANT'S EXHIBIT 19.

Address Bureau of Ordnance, Navy Department, and refer to No. 17761/52 (G).

Department of the Navy, Washington, D. C., Bureau of Ordnance.

October 21, 1905.

2 Enclosures.

SIR: Replying to your two letters of October 19, 1905, relative to the proposed contract for 21" torpedoes, and to secrecy in regard to Bureau improvements of the same:

1. The Bureau desired to express originally the statement made by you that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the suggestion of a possible improvement is made by the Bureau and worked out by you. The case cited by you for example that of the starting mechanism, the

520 Bureau understands would be one in which you could apply the device, if you saw fit, to any torpedoes manufactured by you.

2. The Bureau encloses herewith corrected printers proof of the proposed contract and specifications which it desires you should carefully consider and inform the Bureau if both can be printed as they stand for approval and signature.

3. Your attentions is specially invited to the new clause (Nineteenth) which has been added to the contract on a typewritten sheet, which covers the point referred to in the first paragraph of this letter.

4. An early reply will oblige.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

E. W. Bliss Co., through Inspector of Ordnance.

COMPLAINANT'S EXHIBIT 18.

Address Bureau of Ordnance, Navy Department, and refer to No. 17761/47 (G).

Department of the Navy, Bureau of Ordnance.

WASHINGTON, D. C., October 25, 1905.

Enclosure: 1.

SIR: Replying to your letter of October 13, 1905; quoting price on three hundred (300) Bliss-Leavitt, 5m x 21", Mark I torpedoes:

1. The Bureau does not desire to consider your first proposal, namely, the one relative to torpedoes with same length of air flask as the two present torpedoes of this type.

521 2. The Bureau is disposed, however, to consider the second proposition as modified by conversation held this day with Mr. Leavitt, namely:

(a) Guide lugs, gyro setting gear, starting tube, etc., as set forth in the Bureau's endorsement of this date, No. 17761-54 (G).

(b) Air flask to be twelve (12) inches shorter than those of the two present torpedoes of this type.

(c) Head of torpedoes to be moved forward two (2) inches, as suggested by Mr. Leavitt, and shown on your plan of tentative design of war head of Oct. 23, 1905, presented by Mr. Leavitt, provided you will agree to ensure reliable and safe explosion on oblique impact by mechanical means (use of spring firing pin permitted) within the limits of angular impact required by the specifications.

(d) Physical requirements of air flask forgings to be as suggested by the representatives of the Bethlehem Steel Co., in the presence of Mr. Leavitt, namely steel to be of not less than 90,000 lbs. elastic limit with not less than 15% elongation in a length of two inches, and the limits of variation permitted between all of the test pieces from any one forging to be not more than 20,000 lbs. in elastic limit or 5 % in elongation (see also your letter of Oct. 24, 1905.)

3. While disposed to consider the offer as indicated above, the Bureau is not satisfied with the price that you offer, seventy-one hundred dollars (\$7100) per torpedo. This price is deemed excessive, and the Bureau requests that you will make every possible effort to reduce it. The Bureau believes that the size of the proposed order is such as to warrant you in making an offer lower than any you have yet made.

522 4. In pursuance of further conversation with Mr. Leavitt, the Bureau encloses a copy of a proposed change in the clause of the contract relative to the use by you of devices invented by officers of the Bureau. Is this clause as modified, satisfactory to you?

5. Please reply as promptly as possible so that the Bureau may proceed with the printing of the contract and specifications.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

E. W. Bliss Company, Brooklyn, N. Y. (Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 18 (a).

Clause recommended for insertion in contract between Bureau of Ordnance and E. W. Bliss Company for 300 Bliss-Leavitt 5 Meter, 21-inch, Mark I torpedoes.

It is hereby expressly further stipulated, covenanted and agreed, that the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations, or others, or for other Governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the

523 party of the first part will not exhibit the performance of any torpedo containing such device, either in shop or in service tests, to any person or persons, firms, corporations, or others, or to other governments or their representatives than the party of the second part hereto; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof on any models, designs, devices, appliances, methods or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared material thereof, on account of which payment in any amount shall have been made under this contract, shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money of payments due the party of the first part by the party of the second part under the contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract.

524

COMPLAINANT'S EXHIBIT 17.

E. W. Bliss Co.

Offices: Adams and Plymouth Streets,

BOROUGH OF BROOKLYN, NEW YORK, Oct. 27, 1905.

SIR: In reply to the Bureau's letter No. 17761/47 (A) of the 25th inst., with the exception of paragraph III, which is referred to in another communication, we beg to say:

1. Each of the items mentioned in paragraph II are in accordance with our understanding, and are agreed to by us.

2. Referring to paragraph IV, we accept the clause relative to devices furnished by the Bureau, as modified excepting that in order that there shall be no future misunderstanding on this point, we would suggest that the following be added: "The party of the second part agrees to notify the party of the first part, from time to time, of any devices which it considers to be effected by this clause, and the improvements which shall be construed to be so affected are limited to such as may be mutually agreed upon in writing by the two parties hereto.

Respectfully,

E. W. BLISS CO.
F. M. LEAVITT.

To Chief of Bureau of Ordnance, Navy Department, Washington, D. C. Through Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn, N. Y.

525

COMPLAINANT'S EXHIBIT 16.

Address Bureau of Ordnance, Navy Department, and refer to No. 17761/59 (G).

Department of the Navy, Bureau of Ordnance.

WASHINGTON, D. C., October 28, 1905.

1 Enclosure.

SIR: Replying to your letter of October 27, 1905, relative to clause proposed for the new contract for three hundred (300) B. L. 5m x 21", Mark I torpedoes relative to use by you of devices invented by the Bureau:

1. The Bureau will agree to the first part of your proposed addition to this clause reading as follows:

"The party of the second part agrees to notify the party of the first part, from time to time, of any device which it considers affected by this clause."

2. The Bureau, however, cannot agree to the provision which follows the above, as expressed by you as follows:

"And the improvements which shall be construed to be so affected

are limited to such as may be mutually agreed upon in writing by the two parties thereto."

3. The admission of this last sentence into the contract would place it in your power to absolutely nullify the entire clause, for the use of any or all such devices. Your suggestion in regard to the matter is therefore, in effect, that the Bureau shall place itself absolutely in your hands in regard to the matter; that you shall
526 be given absolute discretion in regard to whether or not you shall make use (what the Bureau would consider to be an improper use) of any devices designed by the Bureau.

4. While not in any way impugning the intentions of your company in regard to the matter, the Bureau calls your attention to the possibility of changes in the composition of your company, as well as of the Bureau. It was particularly to protect itself in the event of such changes that this clause was drawn up, and the Bureau must insist that the Secretary of the Navy, and not your firm, should be the judge (subject to the revision of the proper courts of law) in the matter. In no other way can the Bureau secure the protection which it deems justly due to it.

5. So far as your firm is concerned, the Bureau conceives that the requirement that notice be promptly served upon you in regard to such devices, as worded in the revised draft of the contract, would amply protect you from the results of any changes in personnel in the Bureau.

6. A copy of the proof of the revised contract is forwarded herewith for your consideration. Please favor the Bureau with a reply thereto as soon as possible, returning the proof of the contract with your reply.

Respectfully,

N. E. MASON,
Chief of Bureau.

E. W. Bliss Company (through the Inspector of Ordnance).
R.

527

COMPLAINANT'S EXHIBIT 15.

E. W. Bliss Co.

Offices: Adams and Plymouth Streets.

BOROUGH OF BROOKLYN, NEW YORK, Oct. 31, 1905.

W.

SIR: Replying to your two letters of October 28th, we note the Bureau's remarks regarding the price of the torpedoes and the addition to the clause covering use by us of devices invented by the Bureau. This clause as now proposed by the Bureau is entirely satisfactory to us.

We have gone over fully, the proof of contract, and find same to be satisfactory in all particulars.

In reference to the price of the torpedoes and the Bureau's refusal

to accept the reduction of \$100.00 in price and waive the penalty clause, would state that we feel that this action on the part of the Bureau has fully justified the position we have taken in regard to the price that should be charged for the torpedoes. We can only again emphasize at this writing, in connection with the matter, that it has been and always will be our most earnest desire to treat the Bureau with all possible fairness and liberality in the question of prices.

As requested we herewith return the proof of the contract and beg to remain,

Yours truly,

E. W. BLISS CO.,
F. C. B. PAGE,
Vice-President.

Chief of the Bureau of Ordnance, through Inspector of Ordnance,
Works of E. W. Bliss Co.

528

COMPLAINANT'S EXHIBIT 60.

E. W. Bliss Company.

BROOKLYN, N. Y., Nov. 25/05.

(17761/78.)

SIR: 1. We herewith submit design for the tail of the 21" torpedo as we propose to build it, subject to the approval or suggestions of the Bureau.

2. The only part of the design which is tentative, is the shape of the propeller blades, which will be the subject of a later communication.

3. The change in the design from the former torpedoes consist in the following items:

a. The horizontal rudders are operated by a different system of link and levers, clearly shown by the drawing. The advantage of the arrangement is that the number of pivot joints is considerably reduced, and the long rod for the steering engine to the tail is under tension instead of compression for down rudder.

b. The vertical rudders are placed abaft the propellers, and are operated through a system of shafts and gear sectors as shown.

4. At a speed of 26 knots we estimate that the inboard roll of the torpedo due to centrifugal force in steering a circular course, for a tactical radius of 60 yards, 80 yards and 100 yards will be 17 deg., 13½ deg., and 11 deg., respectively. Under these conditions the action of the vertical rudders will be to cause deep dive. We believe this can be counteracted by making the upper rudders somewhat greater area than the lower, and we have so designed them. It may, of course, be necessary to modify the proportions but this can easily be done at small expense before the work progresses very far.

529

Respectfully,

F. M. LEAVITT.

Chief of Bureau of Ordnance, Washington, D. C., through Inspector of Ordnance, Works of E. W. Bliss Co., Adams and Plymouth Sts., Brooklyn, N. Y.

Office No. 938.

Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co.

BROOKLYN, N. Y., Nov. 25, 1905.

Respectfully forwarded to the Bureau of Ordnance.

Two copies of blue prints AA-10-11 are forwarded under another cover marked "from E. W. Bliss Co. Nov. 25, 1905, No. 1."

L. J. CLARK,
Lieut. Commander, U. S. N., Insp'r of Ordnance.

1st Endorsement.

Bureau of Ordnance, Navy Department.

DECEMBER 14, 1905.

17761/78 (G).

Subject: E. W. Bliss Co.—Submitting design for the tail of 21" B. L. torpedo.

Respectfully returned to the Inspector of Ordnances, U. S. N., E. W. Bliss Company.

530 1. The Bureau approves, in general, the plan of tail shown on the prints forwarded with this letter (E. W. Bliss Co., No. AA-10-11; Bu. Ord. No. 24365). Such approval does not include detailed arrangements.

2. Please inform the Bliss Company that the Bureau's experiments with vertical rudders abaft the propellers show that even with the balanced rudder, the change in position calls for a very large increase in strength in the operating mechanism. With the unbalanced rudders as shown in the print, not only will far greater power be required to operate them, but the corresponding increase in strength of power transmitting mechanism must be provided for.

3. Please return.

N. E. MASON,
Chief of Bureau of Ordnance.

2d Endorsement.

Office of Inspector of Ord., Works of E. W. Bliss Co.

BROOKLYN, N. Y., Dec. 16, 1905.

Subject: E. W. Bliss Co.—Submitting design for the tail of the 21" B. L. torpedo.

17761/78.

Respectfully referred to E. W. Bliss Company. Attention is invited to the 1st endorsement by the Bureau.

Return of papers requested.

L. J. CLARK,
Lieut. Commander, U. S. N., Insp'r of Ordnance.

531

3rd Endorsement.

Office of E. W. Bliss Co., Adams & Plymouth Sts.

BROOKLYN, N. Y., Feb. 7/06.

Subject: E. W. Bliss Co.—Forwarding blue print of Bliss-Leavitt
5m Mark I torpedo.

Respectfully returned to Inspector of Ordnance.

1. The Company notes that the Bureau approves in general of the
plan of tail shown.

Respectfully,

E. W. BLISS CO.,
F. M. LEAVITT.

4th Endorsement.

Office of Inspector of Ord., Torpedo Works of E. W. Bliss Co.

BROOKLYN, N. Y., Feb. 7, 1906.

Subject: E. W. Bliss Co.

Forwarding B. P. of Bliss-Leavitt, 5m x 21" torpedo.

Respectfully returned to the Bureau of Ordnance. Contents
noted.

L. J. CLARK,
Lieut. Commander, U. S. N., Insp'r of Ordnance.

532

COMPLAINANT'S EXHIBIT 51.

No. 17761-(G).

(2 Enclosures.)

Bureau of Ordnance 18457.

(2 Enclosures.)

Navy Department, Bureau of Ordnance.

WASHINGTON, D. C., March 31, 1906.

SIRS: 1. The Bureau learns that some trouble is being experienced
with the pivots for the wheel of the new gyro gear for the 21" Bliss-
Leavitt torpedo.

2. The Bureau encloses copies of Blue-prints (Bu. Ord. Nos. 20634
and 20635) showing bearings designed by employees of this Bureau
which have been used with success both experimentally and in
service and have been found satisfactory.

3. Should you desire to make use of this bearing the Bureau
authorizes such use. The Bureau believes that this bearing, if it can
be adapted to the new gear, would give satisfaction, but this author-
ization for its use should you desire it, must not be construed as
relieving your Company of any responsibility as to the results.

4. You are formally notified that, should you conclude to use this
bearing, it must be done under the Nineteenth Clause of the existing

contract for three hundred 21" torpedoes, exclusively for this Bureau, and that no information in regard to it can be conveyed to others than the parties to the said contract.

5. Lieut. D. W. Knox, U. S. N., Assistant Inspector of Ordnance at your Works, has had practical experience with this device in service.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, 17 Adams St., Brooklyn, N. Y.
(through the Inspector of Ordnance).

COMPLAINANT'S EXHIBIT 54.

(17761/117. Sept. 20, 1906.)

No. 4015.

E. W. Bliss Co., Secretary Desk, 1906.

NAVAL TORPEDO STATION, Sept. 24.

September 18, 1906.

SIR: Referring to the superheater of Bliss-Leavitt torpedoes:

1. There are forwarded herewith sketches to illustrate the following remarks. Fig. 1 shows the heater pot as at present fitted by the Bliss Company; Fig. 2, the heater pot as it has been fitted and tried at the Torpedo Station; and Fig. 3, a proposed arrangement of the heater pot arrived at as a result of experiment.

2. It has been found that the intense heat of the alcohol produces scale on the interior of the heater pot, and other exposed surfaces; it also melts the brass fuse holders. This scale and the nuggets from melted brass settle in the bottom of the heater pot. After a number of runs an ounce or two of this debris accumulates. When the air flask is charged, and the fuel feed valve is opened, air rushes through the fuel feed pipe from the heater pot to the alcohol reservoir. Any debris lying at the opening of the fuel feed pipe is thus carried along with the air. On examination the fuel feed opening into the heater pot was found tightly packed with dirt. On other occasions dirt has been found carried over into the alcohol reservoir. It is therefore evident that, occasionally, the fuel feed pipe may become entirely choked, so that "The fuse will burn, but the alcohol will not." With this arrangement of the heater pot there is also another possible cause of failure of the alcohol to burn. With the delayed action of the igniter apparatus on the 21-inch torpedo, experiments in the dynamometer tank have shown a sudden increase of pressure in the air flask following upon the ignition of the fuze. This rise in the flask pressure is about 200 lbs. If a certain amount of alcohol is unconsumed in the heater pot, this increased pressure will force some or all of it back into the reservoir. If all be forced

back into the reservoir and fuel feed pipe, out of contact with the air, the flame will be extinguished. If, when later the flash pressure is reduced so that the alcohol flows again into the heater pot it will not ignite unless the temperature of the heater pot is sufficiently high.

3. In order to prevent the clogging of the fuel feed pipe, a nipple was fitted in the heater pot, as shown in Fig. 2. This nipple has an axial hole in continuation of the fuel feed pipe, and radial horizontal holes at the top for the egress of the alcohol. This device was fitted to two torpedoes, and has been tried ten times, without failure. Dirt cannot clog the holes and get into the fuel feed pipe or alcohol reservoir. The nipple has shown no bad effects from the heat.

535 The only objection to this arrangement is that, if for any reason, too much alcohol should be fed over, it cannot be driven back by a rise of the flask pressure when the level of the alcohol falls below the radial holes in the nipple, and the alcohol thus remaining would be sufficient to cause undue pressure in the flask.

4. To overcome this one objection, and at the same time to retain the advantage of freedom from clogging, and the retention of a moderate amount of alcohol to preserve combustion, the arrangement shown in Fig. 3 is recommended. In this scheme only a small quantity of alcohol will be held below the level of the outlet. This amount, about 4 cu. in., will not be sufficient to raise the pressure in the flask to a dangerous amount if it should happen to burn while all outlet from the flask is closed. It is therefore recommended that the contractors be required to put this device in all future torpedoes. While it is a very simple change, it is believed that the advantage to be gained by its use will warrant its retention under Clause 19 of the 21-inch contract for the exclusive use of torpedoes manufactured for this government.

Very respectfully,

ALBERT GLEAVES,
Commander, U. S. N.,
Inspector of Ordnance in Charge.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

536

COMPLAINANT'S EXHIBIT 31.

17761/128, Oct. 20, 1906.

E. W. Bliss Company.

BOROUGH OF BROOKLYN, NEW YORK, 17th October, 1906.

SIR: 1. Referring to the service tests of the Mark I 21" torpedo, the writer was at Sag Harbor during the greater part of last week making runs for the purpose of developing the greatest speed and range of which the torpedo is capable.

The weather was, in the main, favorable and the torpedo performed remarkably well, as to depth, deviation and general relia-

bility, but after exhausting every means which suggested itself we have found it is physically impossible to obtain the 3,500 yard range under proper conditions of speed and immersion.

2. At a range of 3,000 yards the torpedo will make 28 knots, or two knots more than the required speed at 3,500 yards.

Altogether eighteen shots were made, in three of which the heater failed and one shot was lost by the breakage of the air tube leading from safety valve to governor breaking nipple, causing the engine to almost stop. Of the three failures of the heater, two were caused by deterioration of the soluble cotton used, which failed to take the flash from the cap. The third failure was apparently caused by the presence of water in the heater pot which diluted the alcohol. This latter can be obviated by draining the flask previous to each run.

3. A record of the last seven shots made exclusive of No. 53 and No. 56 in which the heater failed as above explained is herewith enclosed, as giving a fair idea of the capabilities of the torpedo. In shot No. 58 a piece of the 2,000 yd. net became wound round the propellers which probably accounts for the loss of speed at 3,000 yds., which, by comparison with the run following, would most likely have been about 28 knots.

4. It will be recalled that the speed and range agreed upon for these torpedoes was arrived at in a very arbitrary manner, as no data was at hand. Such data as was available from tests made with the two 21" torpedoes first built, pointed to a very much poorer performance, especially as the flask was to be considerably shortened. After consulting with Mr. Curtis, however, the writer hoped to be able to increase the efficiency of the turbine about 10%, and to increase the efficiency of the propellers by reducing the pitch. Unfortunately, in neither of these directions has it been possible so far to obtain any improvement. The propellers first made for the torpedo had 30 in. pitch, and gave distinctly less range than a pair with 40 in. pitch, other conditions remaining the same.

5. Tests made of the efficiency of the turbine with various forms of air passages through wheels and nozzles did not show any improvement in efficiency, and moreover, the wheels so designed were found to have insufficient strength to withstand the speed, and went to pieces.

6. In view of the fact that no increase in efficiency was obtained so far as the experiments were carried before the rupture of the wheels, and because it would be impossible to make new ones and continue the experiments without seriously delaying the completion of the fifty torpedoes to be finished this year, no recourse was left us other than to proceed with the turbines in accordance with the original design, it being our intention to take the matter up with Mr. Curtis and conduct farther tests during the coming winter.

7. Under these circumstances, and as we have exhausted every means which occurs to us to attain the 3,500 yd. range, we would respectfully request that the requirements be changed to 28 knots at 3,000 yds. in place of 26 knots at 3,500 yds.

8. We would respectfully call the Bureau's attention to the difficulty of obtaining speed with low temperature of the water. In all

acceptance tests of the Whitehead torpedoes heretofore made by us, and in conformity with the practice abroad, the contract speed was made with a temperature of water at or about 68° F. Below this temperature an allowance was made of $\frac{1}{2}$ knot for each 10 degrees below 68° F. This allowance was never included as a term of the contract but was simply due to the well known fact that cold water has a marked effect in reducing speed. This was found to hold true with the Mark 111 torpedoes last winter. Whereas during the summer it was possible to considerably exceed the contract speed, even with less than the full charge of air, during the latter part of the year it required the full power of the torpedo to enable it to comply with the contract. As the range of the present torpedoes is so great that they will be exposed for a much longer time to the chilling effect, we trust that the Bureau will make a reasonable allowance for this unavoidable cause of loss.

Respectfully,

E. W. BLISS CO.
F. M. LEAVITT,
Consulting Engineer.

F. M. L./B./G.,
*Chief of Bureau of Ordnance,
Navy Department, Washington, D. C.*

(Through Inspector of Ordnance.)

539 Works of E. W. Bliss Co., Brooklyn, N. Y.

Shot No.	Regulator.	Speed.		Deviation.		
		2000 yds.	3000 yds.	2000 yds.	3000 yds.	
52	5½			112	-4	Speed not taken. Torpedo just through 3,500 yard net-9 yds.
54	6½	27.54	26.4	-1	-0	Just through 3,500 yd. net.
55	6½	27.54	26.4	17	-	Stopped 50 yds. beyond 3,500 yd. net 197 yds. - speed 24.77.
57	7½	27.75	26.65	11	13	Ran just to 3,500 yd. net.
58	8½	29.36	26.65	14	13	Stopped just short of 3,500 yd. net. Large piece of cross line from 2,000 yd. net wound around propellers.
59	9	29.36	28.04	-17	-20	
60	10	30.43	28.2	-10	-4	

Depth at nets, where observations were taken, in all runs, 7 feet.

1st indorsement No. 145, Oct. 17, 1906, Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co., No. 17 Adams Street, Brooklyn, N. Y.

Subject: E. W. Bliss Co.: Relative to service trials. Respectfully forwarded to Bureau of Ordnance.

1. It is recommended that service trials be authorized for the first five torpedoes at a range of 3,000 yards.
- 540 2. The question of acceptance of torpedoes to be further considered as a result of the trials at a range of 3,000 yards.
3. The Bliss Co. state positively that five 21-inch torpedoes will be at Sag Harbor on the 29th instant.

B. B. McCORMICK,
Lieutenant Commander, U. S. N., Insp'r of Ordnance.

COMPLAINANT'S EXHIBIT 32.

17761/128 (g).

Bureau of Ordnance.

NAVY DEPARTMENT, October 22, 1906.

SIR: 1. The Bureau acknowledges the receipt of your letter dated October 17, 1906, relative to the service trials of the 5 m. x 21 in. torpedo.

2. The Bureau notes with extreme regret the failure of the torpedo to fulfill the requirements as to speed. The Bureau will take this question under consideration, but before reaching a conclusion desires that the Torpedo Board witness the trials of the first lot of torpedoes at Sag Harbor. The endorsement of the Inspector of Ordnance states that these torpedoes will be at Sag Harbor on the 29th instant. The Bureau requests to be informed if it will be convenient to fire these torpedoes on the 30th instant for the benefit of the Board.

3. The Bureau believes that this torpedo can be made to run 3,500 yards, or at least much nearer to that distance than at present, by the installation of an improved propelling mechanism which has recently been tested at the Torpedo Station. The results of
541 these tests in the Mark III indicated that both the range and speed were materially increased and while these improvements may have been due to the elimination of sheer, which the new propelling mechanism accomplishes, and more apparent in the torpedo subject to great sheer, as is the Mark III, than in one where the sheering proclivities were not so pronounced, the Bureau believes that the increases in range and speed are due to some extent to the superior efficiency of the engine itself.

4. The Bureau therefore believes that the trial of this new engine in the 21" torpedo is desirable before a definite abandonment of the

3,500 yard range, and requests that two of the 21 in. torpedoes of the five which will be ready for test on the 29th instant be immediately shipped to the Torpedo Station for the installation of the new engine, the Bureau's action as to acceptance of these torpedoes to be the same as its action on the other three of the lot that will be tested, and in case of rejection of the lot the Bureau to return them to the E. W. Bliss Company in the same condition as received or to pay the amount necessary to place them in that condition, provided the E. W. Bliss Company is not willing to accept the modified torpedoes.

5. When these two have been modified and tested, the Bureau believes that it will possess sufficient data as a result of those tests and the test of the old 21 in. and of another Mark III now in course of modification to reach a conclusion as to the range that can be obtained from the torpedo.

6. As the present model of 21 in. torpedo differs from the one now at the Torpedo Station, and probably will require different tools and accessories including a gyro adjusting stand, the Bureau requests that any special directions for the handling of this torpedo and a list of tools and accessories be sent to the Bureau.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Co. (Through Inspector of Ordnance), Brooklyn, N. Y.

COMPLAINANT'S EXHIBIT 30.

W. H.

BUREAU OF ORDNANCE,
NAVY DEPARTMENT,
November 9, 1906.

17761/128. (G.)

SIR: 1. Referring to your letter of October 17, 1906, referring to the performance of the 21 in. Torpedo and requesting a reduction to 3,000 yards range.

2. In view of the Bureau's belief that a range of 3,500 yards at 26 knots can be obtained with the torpedo by more efficient utilization of the power contained in the air flask, the Bureau feels it its duty to adhere to the requirements as to range in this torpedo until more extensive experiments indicate the physical impossibility of obtaining the desired range.

3. In order that a definite decision can be reached, however; at an early date, the Bureau desires to conduct experiments at the Torpedo Station and will, therefore, accept ten 21 in. torpedoes provided they fulfill all the requirements of the specifications except that the required range for these ten torpedoes will be 3,000 yards. As arranged verbally the turbines of these torpedoes will be modified; the actual cost, in case of success of this modification, to be borne by the E. W. Bliss Company.

4. The Bureau will furnish the E. W. Bliss Company at a later date with plans of balanced turbines turning in opposite directions, which is the principle of the new mechanism, and the Bureau desires that the balanced turbine principle in torpedoes be considered as falling under the provisions of clause 19, of the contract for these torpedoes.

5. In regard to reducing the requirements as to speed in cold weather it would seem that such a course is unnecessary since the torpedo exceeds its required speed in water of less temperature than 68°. But leaving this fact aside, there is some evidence that the reduction in speed noted in the Whitehead in cold weather does not occur in the Bliss-Leavitt and such a difference in performance, it would seem might be expected from the difference between the two types of torpedoes. The Bureau believes that the great loss of speed in the Whitehead was more due to the increase of friction resulting from congealing of the lubricant than to loss of power due to a low temperature, and that since in a torpedo with a superheater the congealing of the lubricant does not occur there should be but slight loss in speed. The Bureau, however, does not desire to arbitrarily decide the matter and will at once investigate the records of torpedoes, fired under different conditions of temperature, and if necessary conduct experiments, before reaching a decision which the Bureau desires to be strictly just.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.
B.

E. W. Bliss Company, Brooklyn, N. Y. (Through Inspector of Ordnance, U. S. N.).

544

DEFENDANT'S EXHIBIT 158.

Dec. 3, 1906.

SIR: We have been asked by representatives of the Japanese Government to show our torpedo to Mr. S. Yamashita, of the Imperial Japanese Navy. Mr. Yamashita called on us to-day. He is en route for Japan from England and we were informed by Captain Fujii, of the Imperial Japanese Navy that the Japanese Government had arranged through him for Mr. Yamashita to call on us and investigate the torpedo. We twice notified the Naval Attache to the Japanese Embassy, Lieut. Comdr. Maomi Taniguchi regarding the matter and asking that he take up the matter of getting permission for our showing Mr. Yamashita the torpedo, direct with you, but his reply indicates that he does not feel at liberty to do this and states that he personally has advised Mr. Yamashita to cancel his design and witness firing tests, etc.

We have, through the Press of late, seen so much agitation in connection with the Japanese and our people in California, we fear a failure of Mr. Yamashita to see the torpedo might be construed as

due to an unfriendly act, and would ask if it is agreeable to the Bureau that we should show the torpedo to Mr. Yamashita.

Very respectfully yours,

E. W. BLISS CO.,

Vice-President.

C., Chief of Bureau of Ordnance, U. S. Navy, Washington, D. C.

545

DEFENDANT'S EXHIBIT 159.

Address Bureau of Ordnance, Navy Department, and refer to No. 19539/9.

Department of the Navy,

Bureau of Ordnance.

WASHINGTON, D. C., December 5, 1906.

2:00. Office of Naval Insp'r. Ord., E. W. Bliss Co., Brooklyn, N. Y.

Received Dec. 6, 1906.

SIR: 1. The Bureau acknowledges the receipt of your letter of December 3, 1906, referring to the investigation of the Bliss-Leavitt Torpedo by Mr. S. Yamashita of the Imperial Japanese Navy.

2. The Bureau understands that it is desired to use for the purpose of this investigation torpedoes being built under contract by the E. W. Bliss Company for the United States Government, as it is only in such case that the Bureau would have any voice in the matter.

3. The Bureau prefers that precedent be not departed from in this case and that the request be transmitted through the regular diplomatic channels provided.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

E. W. Bliss Co., Brooklyn, N. Y. (Through Inspector of Ordnance, U. S. N.)

W. H.

546

DEFENDANT'S EXHIBIT 117.

Office of Inspector of Ordnance at Works of E. W. Bliss Company.

BROOKLYN, N. Y., December 11, 1906.

(Ord. No. 19539/12.)

No. 139.

SIR: In reference to the visit this day of Assistant Engineer S. Yamashita of the Imperial Japanese Navy, I beg to state that a balanced turbine built by the E. W. Bliss Co. was inspected by this Japanese officer. This turbine was lying on the floor of the shop, and the Japanese officer examined the turbine, and rotated by hand the upper disc. In response to inquiry Mr. Leavitt stated that this was an experimental turbine. No further attention was directed to this turbine on the torpedo floor in my presence.

2. In regard to the superheater Mr. Yamashita while examining heater pot made specific inquiry as to the method of spraying fuel in the heater pot. The device of the Bureau covered by Clause 19 of 21-inch contract did not happen to be installed in the pot examined.

3. I beg to call attention to both of these incidents in relation to Clause 19 of the 21-inch contract, and recommend that all improvements originated at the Torpedo Station be also installed there.

Very respectfully,

B. B. McCORMICK,
Lieut. Commander, U. S. N.,
Inspector of Ordnance.

Chief of Bureau of Ordnance, Navy Department, Washington,

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COMPLAINANT'S EXHIBIT 68.

1st Indorsement.

19539/12 (G).

Department of the Navy, Bureau of Ordnance.

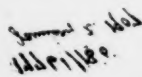
December 17, 1906.

Subject: Inspector of Ordnance, U. S. N., E. W. Bliss Co., Reporting visit of Assistant Engineer S. Yamashita, I. J. N., to Bliss Works.

Respectfully returned to the Inspector of Ordnance, U. S. N., E. W. Bliss Co.

2. The Bureau requests that you will call the attention of the E. W. Bliss Company to this violation of the terms of the contract

Drawing Accompanying Defendant's Exhibit 145.





which the Bureau supposes occurred through inadvertence. The Bureau desires that such inadvertence be guarded against.

3. Please return.

C. W. BARTLETT,
Acting Chief Bureau Ordnance.

2nd Indorsement.

No. 139.

December 20, 1906.

Subject: Inspector of Ordnance, U. S. N., E. W. Bliss Co., Reporting visit of Assistant Engineer S. Yamashita, I. J. N., to Bliss Works.

Respectfully returned to the Bureau of Ordnance.

1. Contents noted.

B. B. McCORMICK,
*Lieut. Commander, U. S. N.,
Inspector of Ordnance.*

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DEFENDANT'S EXHIBIT 145.

17761/185 Jan. 2, 1907.

No. 5419.

Naval Torpedo Station, Newport, R. I.

K

December 29, 1906.

1. It is understood that the E. W. Bliss Company has recently been actively experimenting with a balanced turbine. Also that these experiments were begun subsequent to the meeting of the Torpedo Board at Sag Harbor on October 30, 1906, where the matter was brought up in a way to give the Bliss Company the idea involved, but without details.

2. If the Bliss Company succeeds by its own unaided efforts in developing a balanced turbine, it will be in a position to entirely free itself from the obligations of clause 19 of the 21-inch contract.

3. However, as they have not yet advanced beyond the experimental stage in this device, and have not yet submitted it as the device which they have developed themselves, it is recommended that they be given notice that the provisions of Clause 19 will be enforced, and to this end the Torpedo Station is now prepared as a result of experience, to furnish the Bureau with its latest sketch of the balanced turbine, which is believed to be the best possible design adaptable to replace the Curtis turbine in the space available. That is to say, it is the best design which can be used to replace another turbine, where the direction of motion, space available, etc., are pre-designed, and the balanced turbine must be built to con-

(Here follows diagram marked page 548½.)

form to these prescribed conditions. It is suggested that this sketch be furnished the Bliss Company at the Bureau's convenience.

4. The reasons that such stress has been laid upon Clause 19, and no mention made of the question of patent rights, are as follows:

(a) This clause is very clear, and gives to the Bureau absolute power to enforce its provisions during the life of the contract. As a question of law it seems exceedingly simple and clear.

(b) The patent rights seem necessary principally to safeguard the interests of this Government, after the present contract expires. They also help to back the provisions of Clause 19 during the existence of the contract.

(c) But however broad the claims of a patent may be, they are always matters subject to prolonged litigation. So a corporation, or an individual, might not hesitate to infringe a patent, while the direct violation of a contract would be considered very seriously.

5. A sketch of the turbine now under experiment is forwarded separately, for the Bureau's information. A sketch of the latest design (which is practically the same as this) is in course of preparation, and will be forwarded as soon as completed.

Very respectfully,

ALBERT GLEAVES,
Commander, U. S. Navy,
Inspector of Ordnance in Charge.

Chief of Bureau of Ordnance,

550

COMPLAINANT'S EXHIBIT 29.

Address Inspector of Ordnance in Charge, and refer to No. 2/4.

Naval Torpedo Station.

NEWPORT, R. I., Jan. 2, 1907.

SIR: Referring to Torpedo Station letter No. 5419, Dec. 29, 1906, relative to latest design of Davison's balanced turbine:

1. Two copies of blueprint No. 117-E are forwarded herewith. This is the design for which gears are now building at the Washington Navy Yard. It is believed to be about as good a design as can be accomplished under the prescribed limitations of space and arrangement. Numerous other designs equally good can doubtless be made, for the problem resolves itself simply into an arrangement of gears.

2. For brevity this design has been called Mark III; its predecessor, with idle gears, Mark II; and the first balanced turbine with bevel gears and roller bearings, Mark I.

Very respectfully,

ALBERT GLEAVES,
Commander, U. S. N.,
Inspector of Ordnance in Charge.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

551

(Copy of Endorsements.)

Department of the Navy—Bureau of Ordnance. (1 encl.)
W. K. H.

1st Endorsement.

No. 20361/3 (G).

January 9, 1907.

Subject: Naval Torpedo Station: Forwards two copies of b./p. No. 117-E, showing gears for balanced turbine, now building at Washington Yard.

Respectfully forwarded to the Inspector of Ordnance, U. S. N., E. W. Bliss Company for the information of the E. W. Bliss Company.

2. The balanced turbine falls under the provisions of clause 19 of the contract of the manufacture of 21 inch torpedoes.

3. Please return letter.

N. E. MASON,
Chief of Bureau of Ordnance.
B.

2nd Endorsement.

No. 230.

Jan. 10, 1907.

Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject: Naval Torpedo Station: Forwards two copies of b./p. No. 117-E, showing gears for balanced turbine, now building at Washington Yard.

Respectfully forwarded to the E. W. Bliss Co., with one (1) blue print of Torpedo Station turbine.

2. Please return letter.

B. B. McCORMICK,
Lieutenant Commander, U. S. N., Inspector of Ordnance.

552

3rd Endorsement.

No. 230.

Jan. 21, 1907.

Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject: Naval Torpedo Station: Forwards two copies of b./p. No. 117-E, showing gears for balanced turbine, now building at Washington Yard.

Respectfully returned to Bureau of Ordnance.

1. The E. W. Bliss Co. returned letter this day without comment or endorsement.

2. The stamp of the Company on face of letter and one endorsement shows the letter to have been in their possession.

B. B. McCORMICK,
Lieutenant Commander, U. S. N., Inspector of Ordnance.

DEFENDANT'S EXHIBIT 141.

35-07.

U. S. S. Vesuvius.

NAVAL STATION, KEY WEST, FLA., March 16, 1907.

SIR: Referring to the enclosed firing sheets covering experiments of the past week, the following general observations are made:

Balanced Turbine.

Continual experiments with the Bliss Co.'s design of balanced turbine fitted to torpedo No. 1111 confirmed the conclusion of previous experiments, viz:

- 553
1. The turbine is not completely balanced, but sufficiently to greatly reduce initial roll which is almost imperceptible.
 2. The turbine is about equal in efficiency to the Curtis type—if there is any difference it is slightly more efficient.
 3. The behavior of the torpedo as regards its dive, and keeping its depth and course is much better than any other used here.
 4. On the whole the torpedo behaves much better with this device.

Gyros.

The only novel experiment during the past week was to use a new pallet on gyro No. 1104 which was run in torpedo No. 1112. This gyro like all the others formerly tacked very badly with full rudder throw. By reducing the rudder throw the tacking was diminished but the turning circle was greatly increased. After witnessing Mr. Leavitt's experiments with the graduated helm, it was concluded that all the gyros required the torpedo to turn through too great an angle before the helm could shift. This angle varied from 5° to 10° in various gyros. To get a quick acting gyro, a new pallet was made for the No. 1104. The fork on this pallet is $\frac{3}{8}$ " from tip to tip. The cam on the gyro setting wheel was made with square ends. This change reduced the angle through which the torpedo had to turn to shift helm to 3° . When run with full rudder throw in torpedo No. 1112 there was very little tacking. The only tacking noticed was occasionally, the pallet seemed to miss so that the helm did not shift on time. This is called dancing and is common to all gyros. An effort will be made to stop this objectionable action.

554

Propellers.

The experimental propellers used were set for pitched varying from 30° to 35° .

The set known as type "A" were elliptical, had a true heliocoidal drawing face, and a heliocoidal surface on leading half of back of

blades. They were thinned down as much as was deemed safe, and the edges made sharp. But the material of which they were made was not sufficiently strong so that they were bent and are now useless. While the results obtained with them were about the same as with the regular propellers at 40" pitch they showed no advantage.

The set of 30" propellers which had been made by the Bliss Co. were tried and did not give as good results as the original 40" pitch propellers.

The blades known as type "B" copied from the design of Naval Constructor Taylor were run at 35" pitch but showed no improvement over the old propellers.

The blades known as type "C" with side tips, and increasing axial pitch, have been fitted, but no results have yet been obtained.

The general conclusion to be drawn from the propeller experiments thus far made is that there is no advantage in using propellers of low pitch. If the effect on the speed, and consequently the efficiency of the turbine be considered, the propellers of 30" to 35" pitch would appear less efficient than those of 40" pitch. These experiments will be continued with varying shapes and numbers of blades.

Regulator and Nozzles.

It has been the practice to use two nozzles and a comparatively high regulator setting. To ascertain if this was the best
555 combination, runs were made using 3 and 4 nozzles with only a few turns on the regulator. The only result of note obtained was in one run when the torpedo made practically 30 knots for something like 2,700 yards, attaining an extreme range of 3,975 yards. All the other experiments of this nature indicated that two nozzles with about 8 effective turns on the regulator was the best.

Speed and Range.

No new developments have been made in this respect. When everything works properly the torpedoes are certain to run 3,000 yards at speeds from 26 to 28 knots. The total range obtained is about 2,500 yards, but as the last few hundred yards of this distance is at very slow speed it is not worth considering.

Submerged Tube.

One run was made from the 21-inch submerged tube. It was successful in every respect except that the stop bolt in the spoon jammed. This accident was a repetition of one which occurred when the tube was tested at the Washington Navy Yard. The ship's force is making satisfactory progress in effecting repairs.

Very respectfully,

G. C. DAVISON,
Lieutenant Commander, U. S. Navy.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

(Through Commandant.)

2nd Endorsement.

March 23, 1907.

No. 20489/34 (G) Enclosures.

Subject: "Vesuvius": Commanding Officer reporting experiments for week ending March 16, 1907.

1. Respectfully forwarded to the Inspector of Ordnance, U. S. N., Works of E. W. Bliss Co., together with the boat firing sheets for the week ending March 16, 1907, for the information of the contractors.

2. Please forward the boat firing sheets to the Torpedo Station, returning letter to the Bureau.

C. W. BARTLETT,

Acting Chief of Bureau of Ordnance.

3rd Endorsement.

March 27th, 1907.

Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co.,
No. 17 Adams Street, Brooklyn, N. Y.

Subject: "Vesuvius," Commanding Officer reporting experiments for week ending March 16, 1907.

557 Forwarded for information of E. W. Bliss Co., together with the boat firing sheets for week ending March 16, 1907. Please return.

E. H. DELANEY,

Lieutenant, U. S. N., Act's Insp'r Ord.

COMPLAINANT'S EXHIBIT 61.

Bureau of Ordnance.

O. W. W.

W. K. H.

15157-(G).

NAVY DEPARTMENT, WASHINGTON, D. C., April 6, 1907.

SIR: 1. The Bureau requests that you invite the attention of the E. W. Bliss Company to the unreliability of the starting mechanism of the Bliss-Leavitt 5m 45cm Mark IV torpedo because of the narrow limits of the operation of the starting lever. The Bureau believes that by a change in the design of the starting lever, absolute certainty of starting may be obtained.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

Inspector of Ordnance, U. S. N., E. W. Bliss Company, Brooklyn,
N. Y.

558

COMPLAINANT'S EXHIBIT 69.

17761/233.

E. W. Bliss Company.

* BROOKLYN, N. Y., May 16, 1907.

SIR: With reference to the balance of first lot of 40 Mark I 21 inch torpedoes, beg to state that we have been endeavoring for some time to so improve these torpedoes as to make them meet the contract specifications as to range and speed. We have gone to much expense in making effort, having lengthened gear bearings of turbine frame which made it necessary to make new frames, new pinions and new studs. We have also materially changed the oiling system for the turbines and gears, putting in an additional oil pot for independently oiling turbine and gear bearings, controlling the feed of the oil by a special reducing valve installed for the purpose. We have changed the main air pipe to steel instead of copper. We have improved the exhaust tail valve by putting in a buffer spring in seat and strengthening the legs, which, in our judgment, should obviate the breakages heretofore encountered. We have made an endless number of shop tests to determine the benefit of the above, as well as testing out many other ideas not finally adopted, all of which we can assure you has taken much time. We have during the week made thorough tests of several of the torpedoes at Sag Harbor, and find that notwithstanding our best efforts the torpedo cannot be made to run 3,500 yards. They do, however, run 3,000 yards easily, and in view of the practical impossibility as to meeting the specifications as to range with these torpedoes, we would ask that the Bureau permit of changing the specifications to call for 3,000 yards instead of 3,500 yards. Our trials at Sag Harbor indicate easily 26 knots at 3,000 yards, but while both in range and speed the torpedoes average somewhat better than these figures, we yet consider in order to avoid possible great delays in passing, it is advisable that these figures be adhered to. We feel that if the Bureau will accede to our request, we can begin to deliver torpedoes promptly. If the Bureau desires to witness firing tests at this time at Sag Harbor, we will be pleased to arrange for representatives of this Company to accompany the Bureau's officials at Sag Harbor at such time as may be convenient for the Bureau.

Yours very respectfully,

E. W. BLISS COMPANY.
F. C. B. PAGE,
Vice-President.

ADMIRAL N. E. MASON,
*Chief of Bureau of Ordnance,
Navy Department, Washington, D. C.*

(Through Naval Inspector of Ordnance.)

560

COMPLAINANT'S EXHIBIT 70.

17761/233 (G).

Navy Department, Bureau of Ordnance.

WASHINGTON, D. C. May 25, 1907.

SIR: The Bureau acknowledges the receipt of your letter of May 16, 1907, with reference to the balance of the first lot of 40 Mark I 21 inch torpedoes, and requesting that the requirements of the specifications be so changed as to call for a range of 3000 yards at a speed of 26 knots.

2. The failure of these torpedoes to fulfill the requirements of the specifications is a source of keen regret to the Bureau, as it involves either the acceptance of a torpedo inferior to the weapon which the Bureau hopes to obtain or a further delay in deliveries.

3. Of the two evils, between which the Bureau must choose, the former seems to be the lessor, and the Bureau is, therefore, willing to enter into the following arrangement as regards the 5m x 21 inch torpedoes Mark I (1st lot).

(a) That the range for test of these torpedoes be reduced from 3500 yards to 3000 yards.

(b) That the maximum lateral deviation be reduced from 50 yards to 43 yards.

(c) That the requirements as regards the curved runs shall be the same as laid down for 5m x 21 inch Mark II torpedoes.

(d) That the price of these torpedoes shall be reduced from \$7,100 to \$6,000.

(e) That this agreement if accepted shall apply to torpedoes of this lot that pass the modified tests before August 1, 1907, and to those only, and that after that date the original specifications for this lot shall govern.

(f) The Bureau will extend the time of delivery of this lot of torpedoes until August 1, 1907, this extension to apply to this lot only and not to the remaining 250 torpedoes.

4. The Bureau requests an early consideration of this proposal. Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Co., Brooklyn, N. Y. (Through Inspector of Ordnance.)

COMPLAINANT'S EXHIBIT 71.

E. W. Bliss Company.

No. 1776/250.

BROOKLYN, N. Y., June 25, 1907.

Mr. N. E. Mason, Chief of Bureau of Ordnance, Navy Department,
Washington, D. C.

DEAR SIR: With reference to the Bureau's letter of May 25th, in regard to changes in specifications covering the balance of the 1st lot of 40, Mark I, 21 inch torpedoes, beg to say that we have noted the conditions as specified by the Bureau. We respectfully suggest the following changes:

The width angle tests to be the same as laid down for 5 meter, 21 inch Mark II torpedoes, except turning radius to be 100 yards instead of 80 yards.

The Bureau to extend the time of delivery of this lot of
562 torpedoes until October 1st, instead of August 1st. (This extension to apply to this lot only.)

As regards the question of modification of price from \$7,100 to \$6,000, or in other words penalizing us to the extent of \$1,100 per torpedo, would say that it seems to us, in the interpretation of this contract that in justice and equity, the conditions under which it was entered into should be taken into consideration.

Contracts for commercial articles or even battleships are based on the known performance of previous similar constructions. For the performance of the torpedo there was no previous adequate data.

If these contracts had been for the Whitehead torpedo as constructed by us for the U. S. Navy during the past fifteen years or more, delays and failure to conform to the letter of the contract would be inexcusable and we would not feel justified in taking exception to its strictest and most literal reading.

The Whitehead torpedo was limited to a small radius of action, and although great efforts had been made in all countries where it was in use to increase its range and speed no appreciable advance was made until we devised a method by means of which the air could be heated, thus increasing the performance by fully 100%. It was a well known fact that by adding heat the efficiency of any engine operated by compressed air could be greatly increased, but until we accomplished it, no one had been able to practically apply the principle to a torpedo.

At the time of entering into the contracts for the Bliss-Leavitt torpedoes, this Company had already expended large sums
563 of money in developing the turbine driven torpedo with super-heater, and Boards of Navy Officers had seen from the performance of the experimental models that it possessed great possibilities, and would surely supersede the old Whitehead type.

The contracts were entered into by us in good faith and based upon what we fairly thought could be accomplished, but it was quite well understood by the Navy Department, as well as our-

selves, that the performance required by the contracts was not based on results previously attained; but on certain improvements which at the time it seemed reasonable to suppose could be made in the efficiency of the turbine and the super-heater.

After the contracts were signed we went diligently to work, but after a large expenditure of money in further experiments, it was found that the expected improvements were disappointing, and that in the case of the 21 inch torpedo the performance fell short of the required 3500 yard range.

Last year when we notified you of the fact, if the Bureau had been willing to reduce the range to 3000 yards for the 1st 50 torpedoes, we believed we should have been able to finish this lot within the time specified; as, at that time, the Bureau did not feel justified in making this change, we worked very hard and at great expense all through the winter and up to the present time to so modify the torpedoes, as to bring them up to the required range and speed. No expense has been spared by us in this direction so that, so far from expecting any profit from the contract, we can only look forward to a disastrous loss.

564 In the course of practising over the firing range many points have developed where we could see that trouble might be experienced by the Navy in handling and operating the torpedo, and in every such case, although not specified in the contract, we have not hesitated to throw thousands of dollars' worth of finished material in the scrap pile and substitute improvements, solely with the view of delivering the best possible weapon to the Department.

During the time that this work was in hand Messrs. Armstrong, Whitworth and Company took up our idea of the super-heater and made certain improvements therein. We immediately acquired the rights to these and ever since January last have been at work adapting them to our torpedo with a view of introducing them into the 250 remaining to be built under the contract for 300. Judging from our shop tests, we feel justified in saying that all but the first fifty (50) of the three hundred (300) torpedoes will considerably exceed the requirements of the contract, probably giving a speed of upward of 26 knots over a range of 4,000 yards.

We expect to be able to make a practical test of this torpedo over the range within the next ten (10) days, and as the various parts of the balance of the lot are well under way, we will within a few months be able to deliver them as fast as the weather will permit.

We believe that any Board of Officers, who would carefully go over the facts, which we have tried to briefly set forth, would be forced to conclude that we have energetically and honestly grappled with a vast number of unforeseen problems, and that while we have not altogether surmounted them in the first torpedoes, the majority will be well up to the highest efficiency demanded by the contract, and that these unexpected difficulties have been caused by unavoidable delays, which fairly come within the clause

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of the contract which entitles us to extension of time for causes unavoidable and beyond our control.

Yours very truly,

E. W. BLISS CO.
F. C. B. PAGE.

Mailed too late to be forwarded thro' Inspector. Copy will be furnished him.

E. W. BLISS CO.

COMPLAINANT'S EXHIBIT 72.

Bureau of Ordnance, Navy Department.

17761/250 (G).

JULY 8, 1907.

SIR: Referring to your letter of June 25, 1907, in regard to changes in the specifications covering the balance of the 1st lot of forty Mark I, 21 inch torpedoes.

2. The Bureau will authorize the change in the specifications for these torpedoes making the requirements as to wide angle fire the same as laid down for the 5m x 21 inch Mark II torpedoes, except that the maximum turning radius shall be 100 yards instead of 80 yards.

3. The Bureau will extend the time of delivery of these torpedoes until October 1st instead of August 1st.

4. As regards the question of modification of price from \$7,100 to \$6,000, the Bureau feels that it must insist upon the reduction, and in reaching this conclusion, the Bureau has fully considered the conditions under which it was entered into and also the past history of this contract. As the Bureau does not wish to seem arbitrary in this matter, it will briefly review this history and the correspondence dealing with the price of these torpedoes. The correspondence referred to is contained in letters from the E. W. Bliss Company dated October 13, 1905, and October 27, 1905, and Bureau's letter No. 17761/47 (G) dated October 25, 1905. The first letter gave the terms on which the torpedoes would be furnished, the Bureau's letter was an acceptance of those terms except as to price, and the last letter was a statement from the Company dealing entirely with the question of price.

5. In this last letter the Company gave as its reasons for what under other circumstances would be an unreasonably high cost. These reasons were briefly, that this torpedo was not a commercial article, that its promised performance was beyond anything ever before offered and that while the company felt reasonably sure that it would be able to fulfill its promises that "human foresight was fallible and many great and unforeseeable expenses may and no doubt will be encountered, and we feel that it is no more than reasonable and just that we should have a fair margin for the unforeseen reverses," as the burden of responsibility of them falls on us and

the Bureau assumes' none. "The letter further states that the penalty for overtime adds to our risk, where the loss to us from the delay itself would be sufficient punishment," and "that the Bureau would be sufficiently protected by the penalty clause of the contract." The letter closed with a disclaimer of any intention of driving a hard bargain and offered a reduction of \$100 per
567 torpedo in case the penalty clause referring to delays in deliveries was omitted.

6. The Bureau then accepted the original proposal to furnish these torpedoes at a price of \$7,100 each, and entered into a contract with the Company to furnish 300 5m x 21 inch torpedoes at that price, fifty torpedoes to be delivered by January 1, 1907, and one hundred and twenty-five during each calendar year until the contract would be completed.

7. The results to date are as follows:

(a) Practically all air flasks have been completed, and first payments at the rate of \$3,000 for each air flask have been made to the Company amounting to about \$900,000.

(b) Ten torpedoes have been accepted under certain conditions without passing the acceptance trials.

(c) No torpedoes have fulfilled the requirements of the specifications either as originally laid down or as now proposed.

8. The progress of fulfilling the contract has been as follows:

Trial runs of 5m x 21 inch torpedo No. 1103 were commenced in July, 1906, and the first lot of five torpedoes were sent to Sag Harbor before passing the shop test, about October 10, 1906. On October 17, 1906, after trials of these torpedoes, the Company asked for a reduction of the range required by 500 yards. The Bureau declined to make this reduction believing that the torpedo could be made to go 3,500 yards, and that the Company should make an effort to overcome the unforeseen reverse even if such action called for the great expense provided for in fixing a high price for these
568 torpedoes. At the same time the Bureau took over ten torpedoes, and with these torpedoes tried out various devices at

Key West at great expense, the results of the trials being freely communicated to the Company. The Company's letter of June 25, 1907, indicates that the Company now shares the Bureau's belief that it is not a physical impossibility to drive a 5m x 21 inch torpedo at 26 knots for a distance of 3,500 yards, in fact the Company speak of a 4,000 yard range.

9. Briefly the Bureau's understanding of the situation is the E. W. Bliss Company entered into a contract to furnish a number of 3,500 yard torpedoes and charged a price large enough to cover the cost of development and manufacture, give a fair profit and to provide for extra expenses, assuming all responsibility. They now wish to supply 3,000 yard torpedoes at the price of 3,500 yard torpedoes at the same time acknowledging that they can supply 3,500 yard torpedoes, and practically the only reason urged for the acceptance of these short range torpedoes is that the Torpedo Station did not develop the balanced turbine and the Armstrong Company did not develop the outside superheater in time for the Company to incorporate these improved devices in the first lot of torpedoes.

10. There is one point the Bureau desires to make clear, as it may help to an understanding of the Bureau's action in this matter. The Bureau as an agent of the Government, is held responsible for the economical expenditures of its appropriations, and for the supply of the most efficient Ordnance Material. The present condition of the Navy as regards torpedoes is due to the failure of the E. W. Bliss Company to fulfill its contracts. Had the Company delivered on time 3500 yard torpedoes, the Bureau could bear with a clear conscience the responsibility of paying an excessive price, but since the Company has failed to fulfill its contract, the Bureau objects to assuming the responsibility of paying for a torpedo superior to the one delivered.

11. In regard to the statement that when last year the Company requested a reduction of range, that had the Bureau acceded to this request, the Company believes that this lot of torpedoes would have been delivered on time, the Bureau invites attention to the facts that this would have required that five torpedoes be passed each week, even if firing had been possible during December, and that the Company now asks a longer time in which to deliver these torpedoes than the eleven weeks between October 15th and January 1st. It is pertinent to note that none of the torpedoes fired so far this summer would have passed the reduced requirements. But while not admitting that the action of the Bureau in insisting on the fulfillment of the requirements of the specifications can possibly be considered a just reason for asking for an extension, the Bureau considers that its extension of the time of delivery to October 1st, 1907, a period of nine months, and the consequent remission of penalties for delays in deliveries amounting to over \$192,000 should be considered by the Company as sufficient compensation for any loss sustained.

12. The Bureau notes the statement that the contract was entered into in good faith, and this the Bureau has never doubted, but at the same time the Bureau desires to point out that the company now ask the Bureau to accord to it all the benefits that a Company acting in bad faith would ask, and that the acquiescence of the Company to the proposals of the Bureau would constitute the only convincing argument of the good faith of the Company to one who had but the record of this contract before him and had no knowledge of the personnel of the Company or its other business actions.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance.)

COMPLAINANT'S EXHIBIT 73.

BUREAU OF ORDNANCE,
Navy Department,
Washington, D. C., Oct. 24, 1907.

17761/233 (g).

Sir: Referring to Bureau's letter Nos. 17761/233 (G), dated May 25, 1907, and 17761/250 (G), dated July 8, 1907, in regard to forty (40) 5m x 21 inch Mark 1 torpedoes:

1. The Bureau invites attention to paragraph 2 (c) of the first mentioned letter in which it is stated that "this agreement if accepted shall apply to torpedoes of this lot that pass the modified tests before August 1, 1907, and to these only, and that after that date the original specifications for this lot shall govern and to paragraph 3 of the letter No. 17761/250 (G) in which the date of delivery of these torpedoes was extended to October 1, 1907, and the period during which the agreement should be operative was extended by implication to the same date.

2. The extended period during which the torpedoes were 571 to be subject to the reduced requirements provided the Bureau's proposal was accepted by the Company, having expired without the acceptance by the company of that proposal, the Bureau desires to state that the original requirements of the specifications will govern as regards 5m x 21" torpedoes after this date and the Bureau requests a statement from the company at the earliest practicable date and not later than November 1, 1907, as to whether the Company will agree or not to the Bureau's proposal as regards torpedoes tested prior to this date.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.

E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 74.

E. W. Bliss Company.

BROOKLYN, N. Y., October 30, 1907.

No. 27761/296.

SIR: Your letter of October 24th is at hand. In reply to same beg to request that the period during which the modified specifications shall apply be extended indefinitely without regard to the acceptance or non acceptance by this company of the Bureau's proposal, suggesting a modification of price.

II. We will be glad to turn over the Mark I torpedoes to the Bu-

reau as soon as they have passed the modified specifications, leaving the question of price to be settled later.

572 III. We have been making every effort to improve the Mark I torpedoes as to bring them up to the original specifications, and are at the present time experimenting at Sag Harbor with a Mark I torpedo with an improved inside heater which we are in hopes will give the desired range and speed, and in consequence of this we make the above request for modified specifications to still be left in force, and the final settlement as to price left open until we can tell you definitely as to whether we will be able to so improve the torpedoes as to bring them up to the original specifications.

We sincerely trust that the Bureau will, in view of the great efforts we are making, accede to our request in this matter.

Respectfully,

E. W. BLISS COMPANY,

F. C. B. PAGE,

1st Vice President.

Admiral N. E. Mason, Chief of Bureau of Ordnance, Washington, D. C.

No. 97. Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn, N. Y., Oct. 30, 1907. Respectfully forwarded. B. B. McCormick, Lieut. Comd'r U. S. N., Inspector of Ord.

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COMPLAINANT'S EXHIBIT 58.

No. 179.

1 enclosure.

NAVAL TORPEDO STATION, B.

NEWPORT, R. I., M'ch 23, 1908.

SIR: Referring to Bureau's letter No. 21715, M'ch 20, 1908, in regard to Gastezy's superheating system:

1. I have the honor to enclose a blue print of the system as it is understood by the Torpedo Station from the sketch in the Revista Martima Brasileira.

2. The operation of the system is as follows: Before firing, the water chamber is filled with water through the filling plug and filling pipe. The retarding valve is operated by the water tripper, which, when thrown back, opens the valve, admitting air from the reducing valve simultaneously to, 1st, the water chamber; 2nd, the primer pistol; and, 3rd, the alcohol chamber. The arrows indicate the flow of the air, water and alcohol. The action of the water spray around the upper part of the combustion chamber is clearly shown in the accompanying blue print.

3. This system apparently presents an excellent means for overcoming the inherent trouble of excessive heating caused by the outside superheater, if space can be found in the torpedo for accommodating the apparatus, and it is suggested that the E. W. Bliss Co., who are to manufacture the superheater, be requested to consider this design.

4. The copy of the Revista Maritima Brasileira is retained for the present.

Very respectfully,
(Signed)

ALBERT CLEAVES,
*Commander, U. S. N.,
Inspector of Ordnance in Charge.*

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

574 Enci.

B. F. S.

Department of the Navy,
Bureau of Ordnance.

1st Endorsement.

No. 21715/2 (G).

March 26, 1908.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system, described in Revista Maritima Brazileria.

1. Respectfully forwarded to the Inspector of Ordnance, E. W. Bliss Company.

2. Please bring this matter to the attention of the E. W. Bliss Company.

3. Please Return.

(Signed)

N. E. MASON,
Chief of Bureau of Ordnance.

2nd Endorsement.

Enclos. 1.

March 27, 1908.

Office of Inspector of Ordnance,
Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system, described in Revista Maritima Brazileria.

Respectfully referred to the E. W. Bliss Co. Attention is invited to the Torpedo Station's letter and to the Bureau's endorsement.

2. Please return.

(Signed)

W. S. MILLER,
Lieutenant, U. S. Navy, Inspector of Ordnance.

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Endorsement: April 4th, 1908. Office of E. W. Bliss Company, Adams & Plymouth Streets, Brooklyn, N. Y.

Subject.

Naval Torpedo Station :

Comments on Gesztezy's superheating system, described in *Revista Maritima Braziliera*.

Respectfully returned to the Inspector of Ordnance, Works of E. W. Bliss Co.

We herewith return the drawing of the Gesztezy's superheating system, and would state that we have for some time had plans on the same general principle as that shown. We believe there are inherent difficulties against the successful operation of such a system although we intend at as early a date as possible to make certain tests of same.

Respectfully,

(Signed)

E. W. BLISS CO.,
F. H. B. PAGE,
Vice-President.

4th Endorsement.

No. 74.

Enclos. 1.

April 6, 1908.

Office of Inspector of Ordnance,
Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject.

Naval Torpedo Station :

Comments on Gesztezy's superheating system, described in *Revista Maritima Braziliera*.

576 Respectfully returned to Bureau of Ordnance.

2. Contents noted.

(Signed)

W. S. MILLER,
Lieutenant, U. S. Navy, Inspector of Ordnance.

Department of the Navy,
Bureau of Ordnance.

5th Endorsement.

No. 21715/2 (G).

April 8, 1908.

Subject.

Naval Torpedo Station :

Comments on Gesztezy's superheating system described in *Revista Maritima Braziliera*.

1. Respectfully forwarded to the Inspector of Ordnance in Charge, Naval Torpedo Station, for his information and comment.

2. Please return.

(Signed)

N. E. MASON,
Chief of Bureau of Ordnance.

6th Endorsement.

#179.

B.

Encl.

NAVAL TORPEDO STATION,
NEWPORT, R. I., Ap'l 10, 1908.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system described in *Revista Maritima Brasileira*.

Respectfully returned to the Bureau of Ordnance.

2. From recent experience at the Torpedo Station with the Whitehead outside superheater, it is possible that no great danger of injury to the engine is to be apprehended from the use of the outside superheater in its present form. It is thought, however, that, to insure safety, a superheater on the lines herein described will be desirable, and it is recommended that the Bliss Co. be encouraged to make the experiments suggested by them in the 3rd endorsement.

(Signed)

ALBERT CLEAVES,
Commander, U. S. Navy,
*Inspector of Ordnance, in Charge of Station.*Department of the Navy.
Bureau of Ordnance.

7th Endorsement.

Encl.

B. F. S.

No. 21715/2 (G).

April 17, 1908.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system, described in *Revista Maritima Brasileira*.

1. Respectfully forwarded to the Inspector of Ordnance, E. W. Bliss Company.

2. The Bureau requests to be informed of the results of any experiments which the Bliss Company may make with the superheater of this type.

3. Please return.

(Signed)

N. E. MASON,
Chief of Bureau of Ordnance.

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8th Endorsement.

No. 74.

Enclos. 1.

Office of Inspector of Ordnance,
Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating-system described in *Re-vista Maritima Brasileira*.

Referred to E. W. Bliss Co., inviting attention to the preceding endorsement hereon.

2. Please return.

(Signed)

W. S. MILLER,
Lieutenant, U. S. Navy, Inspector of Ordnance.

9th Endorsement.

June 9th, 1908.

Office of E. W. Bliss Company,
Adams & Plymouth Streets, Brooklyn, N. Y.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system described in *Re-vista Maritima Brasileira*.

Respectfully returned to Inspector of Ordnance.

2. We have not as yet made any progress with experiments with this superheater, but will gladly report to the Bureau the results of any experiments which we shall make.

3. At present our testing facilities are so fully occupied with torpedoes under way for the Bureau, that it is impossible for us to conduct any outside experiments.

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Respectfully,

(Signed)

E. W. BLISS CO.,
F. M. LEAVITT.

10th Endorsement.

No. 74.

June 10, 1908.

Office of Inspector of Ordnance,
Torpedo Works of E. W. Bliss Co.,
No. 17 Adams St., Brooklyn, N. Y.

Subject.

Naval Torpedo Station:

Comments on Gesztezy's superheating system, described in *Re-vista Maritima Brasileira*.

Respectfully returned to Bureau of Ordnance.

2. Attention invited to the preceding endorsement.

(Signed)

W. S. MILLER,
Lieutenant, U. S. Navy, Inspector of Ordnance.

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DEFENDANT'S EXHIBIT 149.

Address Bureau of Ordnance, Naval Department, and refer to No. 22569/80 (G).

E. L. B.

WASHINGTON, D. C., March 16, 1910.

E. W. Bliss Co.
Secretary's Desk
1910
Mar.
17.

SIRS:

1. Referring to letter No. 50 of the Inspector of Ordnance at your Works, as yet unanswered, and to blue print AA-15-18, Bureau of Ordnance No. 33565, forwarded February 24, 1910, requesting removal of "change in piece 5" of that drawing; you are informed that the Inspector of Ordnance at your Works has this day been notified of the Bureau's disapproval of the change requested.

2. It appears from the shop tests of the depth engine Mark III, 21", shown on the blue print referred to, that this engine gives variable results, differing in each of the tests so far made, as a reference to the records of such tests will show. It is indicated that this engine is a "follow up" engine on one stroke, the dive, and a "hard-over" on the reverse stroke, "the broach," a condition which cannot be accepted. The change requested in the blue print submitted is not approved, inasmuch as this change is for the purpose of making the depth engine function for its tests, and is not a remedy for what appears to the Bureau to be a defect in the design of the valve. The design of this valve allows leaks, which by the nature of the valve design unbalances the piston which controls the steering rod; to obviate this the control valve is chamfered off so as to allow another leak to make up for this unbalanced condition. This the Bureau does not approve, and requests that you have the design of this control valve so changed that the depth engine will act symmetrically on each stroke and with the same sensitiveness to "dive" as to "broach" inclinations of the torpedo.

Respectfully,

N. E. MASON,
Chief of Bureau of Ordnance.
B.

The E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

(Endorsement on back of letter:) Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co., No. 17 Adams St., Brooklyn, N. Y. March 17, 1910. Respectfully submitted, F. W. Toppan, Ensign, U. S. N. (Ret.), Act'g Insp'r Ord.

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DEFENDANT'S EXHIBIT 150.

Works of the E. W. Bliss Company.

BROOKLYN, N. Y., March 21, 1910.

Sir: In compliance with the order 3153/74 of March 18, 1910, from the Secretary of the Navy, the Board met at 10:00 A. M.

Present:

Commander M. L. Bristol, U. S. N.,
Commander A. L. Norton, U. S. N.,
Lieutenant J. H. Tomb, U. S. N.,
Lieutenant F. R. McCrary, U. S. N., members.

The Senior Member read the order from the Secretary of the Navy convening the Board; said order attached marked "A."

The Board was organized and the minutes of the previous meeting was submitted to the Board.

The Senior Member read the letter from the Chief of the Bureau of Ordnance, submitting the questions to be considered at this meeting of the Board; said letter attached marked "B."

The Board took up the question marked "Four."

* * * * *

TUESDAY, March 22, 1910.

The Board met at 10 A. M., and the proceedings of the previous day were read and approved.

* * * * *

The Board adjourned at 6 P. M., until 10 A. M., Wednesday, March 23rd, 1910.

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WEDNESDAY, March 23, 1910.

The Board met at 10 A. M., present all the members, Lieut. Hellweg, Inspector of Ordnance, and the representatives of the Bliss Company, Mr. Page and Mr. Leavitt.

* * * * *

The Board then took up question number one. The Board examined the depth engine for the Mark III, 21" torpedo as originally designed, and one as modified by the Bliss Company. Both types of engine were examined, dismantled, and operated on the bench. They were then installed in torpedoes and tested on the stand for the observation and inspection of the Board, in order that they might examine the action of these engines. The question of design and

modification was then discussed by the Board with Mr. Leavitt, the Company's Engineer. The Board then adjourned at 6:25 P. M., to meet at 10 A. M., Thursday, March 24th.

Thursday, March 24: The Board met at 10 A. M., all members being present; Inspector of Ordnance Lieutenant Hellweg, and representatives of the E. W. Bliss Company being present, the Board proceeded with the discussion of Question Number One, which was interrupted on the adjournment of the Board on the previous day.

The Board asked Mr. Leavitt, Engineer of the Bliss Company, if he would take up the question of a new design for the Mark III, in order to eliminate the defects pointed out by the Board in the present design, as originally designed and as modified, pending the Bureau's decisions on the report of the Board. Mr. Leavitt replied that he would, and later presented to the Board a sketch for its consideration. This sketch was considered with Mr. Leavitt, and other

points suggested were considered, and Mr. Leavitt was requested to further develop a new design to meet all objections of the Board. The Board considered all the questions submitted to it in the letter from the Bureau of Ordnance, and asked the representatives of the E. W. Bliss Company if they had any further questions which they wished to discuss before the Board, to which they replied that they had not.

The Board having no further questions to consider, requested all to withdraw, except the members of the Board, to consider all the facts set before it, and make the following recommendations:

Question Number One. "The present design of the Mark III 5m x 21" depth engine, its design and method of functioning, as originally designed, the method suggested by the E. W. Bliss Company to correct the defects of this engine, and the advisability of retaining this engine, either as originally designed or as modified by the E. W. Bliss Company's proposed change. Whether a new design should be required, or the present one installed in the Mark III and Mark VI torpedoes, and if a new design, a suggestion as to what this design should be, having in mind the specifications and contract and the fact that these torpedoes are practically completed and are being manufactured under a contract already entered into with the contractors, and the drawings therefor have been approved by the Bureau."

The design approved by the Bureau of Ordnance does not function satisfactorily. The modification suggested by the E. W. Bliss Company improve- the functioning of this engine, but does not give a satisfactory steering engine. It is recommended that the E. W. Bliss Company proceed with the new design to overcome the objections pointed out by the Board, which objections have already been explained to the Bliss Company in the Bureau of Ordnance correspondence.

These objections, generally, refer to unbalanced pressures in either end of the engine piston, and the method of making joint in the bulkhead and connection for the air supply. The modifications of this design originally approved by the Bureau does not constitute a

change in design, and in view of the fact that this steering engine is practically of the same type as has been used in the service before, the Board does not consider the E. W. Bliss Company responsible to the extent of requiring them to furnish a new steering engine without some compensation, and further that the delivery of these torpedoes would be delayed by the redesign and installation of a new steering engine; it is recommended that the Bliss Company be allowed to proceed with the trial test of the Mark III torpedo, as now completed and fitted with modified steering engine, where such torpedoes are assembled and ready for shop test and trial test, amounting to about thirty-five torpedoes, and that in the meantime the new design of depth engine be tested by the E. W. Bliss Company and estimates of cost and delay consequent to the fitting of the new engine be submitted to the Bureau further recommends, if necessary in order not to delay the delivery of the forty-two 5m x 21" torpedoes on contract of April, 1909, that the installation of the modified design as submitted to the Bureau of Ordnance be permitted in the whole lot of forty-two torpedoes under this contract.

In the forty-five Mark IV torpedoes being manufactured under contract No. 205 of March 25, 1906, it is recommended that the depth engine be made to conform to the modified design as submitted to the Bureau of Ordnance on blue print AA-15-18 (Bureau 586 of Ordnance No. 33565).

It is believed that by this arrangement the E. W. Bliss Company can proceed with the manufacture of all torpedoes now under contract, and have sufficient torpedoes to keep their testing station running all available time, and develop the design of depth engine for the sixty Mark III torpedoes under contract No. 337, and the one hundred Mark VI, without any delay and no loss of material except such as may be now on hand for the manufacture of depth engine, which material must necessarily be very small in amount.

* * * * *

Question Number Five. The present condition of the 45 torpedoes being manufactured on contract number 205 of March 29, 1905, and especially with reference to the tests that will be necessary for the acceptance of torpedoes number 1065, 1055, 1059, 1060, 1063, 1066, 1067, 1071, 1080, 1084, 1089, 1091, 1096, 1099, 1101.

It is recommended that the torpedoes be fitted with a modified depth engine as shown on plan AA-15-18 (Bureau of Ordnance No. 33565), submitted for the Bureau's approval by the E. W. Bliss Company; the torpedoes be then submitted to shop tests as prescribed by the last contract, terminated December 30, 1909, and further that they be given service trials as follows:

First. 30 Mark IV 5m x 45cm torpedoes that have already been run on the range and submitted for acceptance be given three start runs each, according to the arranged contract for service trials.

Second. That of every five torpedoes submitted for this test one shall make the total number of runs required by the specifications, as referred to above.

587 Third. The remaining 15 torpedoes of the 45 to make the original tests required by the contract, which terminated on December 30, 1909.

Fourth. Provided that nothing is allowed to interfere with the carrying on of the tests of these torpedoes when they are ready for trial, except that one Mark III 5m x 21" torpedo as referred to above, have come to a condition warranting their trial on the range, these torpedoes may be tried at the same time as the Mark IV torpedoes referred to above provided such trials do not delay the delivery of the 45 Mark IV torpedoes, whose contract terminated on December 30, 1909.

* * * * *

The Board then having completed all the questions placed before it adjourned at 6:25 P. M.

Respectfully,

MARC L. BRISTOL,
Commander, U. S. N., Senior Member.
A. L. NORTON,
Commander, U. S. N., Member.
J. H. TOMB,
Lieutenant, U. S. N., Member.
F. R. McCARY,
Lieutenant, U. S. N., Member.

The Honorable The Secretary of the Navy.

588

COMPLAINANT'S EXHIBIT 63.

E. L. B.

22569/80(G).

March 31, 1910.

SIR: Referring to the Bureau's letter No. 22569/80 of March 16, 1910, relative to the depth engine of the Mark III, 5m x 21" Bliss-Leavitt torpedoes, and to your letter of March 12, 1910, and to the report of the Torpedo Board recently in session at your works:

1. The Bureau informs you of its decision in advance of the final approval of the report of the Torpedo Board on the subject of the Mark III, 5m x 21" depth engine, in order that there may be no more delay than necessary.

2. The design approved by the Bureau of Ordnance does not function satisfactorily. The modifications suggested by the E. W. Bliss Company improve the functioning of this engine, but does not give a satisfactory steering engine. The Bureau requests that the E. W. Bliss Company proceed with the new design to overcome the objections pointed out by the Board, which objections have already been explained to the Bliss Company in the Bureau of Ordnance correspondence.

These objections, generally, refer to unbalanced pressures in either end of the engine piston, and the method of making joint in the bulkhead and connection for the air supply.

The Bureau understands that the E. W. Bliss Company's engi-

neer, Mr. Leavitt, has already in hand the design of a depth engine which may — readily substituted for the present design of the Mark III, 5m x 21", which new design will overcome the objections to the present design that now exists.

589 The modifications of this design originally approved by the Bureau does not constitute a change in design, and in view of the fact that this steering engine is practically of the same type as has been used in the service before, the Bureau does not consider that the E. W. Bliss Company is responsible to the extent of requiring them to furnish a new steering engine without some compensation, and further that the delivery of these torpedoes would be delayed by the redesign and installation of a new steering engine; it is directed that the E. W. Bliss Company proceed with the trial test of the Mark III torpedo, now completed and fitted with modified steering engine, where such torpedoes are assembled and ready for shop test and trial test, amounting to about thirty-five torpedoes, and that in the meantime the new design of depth engine be tested by the E. W. Bliss Company, and estimates of cost and delay consequent to the fitting of the new engine be submitted to the Bureau of Ordnance, and the Bureau further directs, if necessary in order not to delay the delivery of the forty-two 5m x 21" torpedoes on contract of April, 1909, that the installation of the modified design as submitted to the Bureau of Ordnance be permitted in the whole lot of forty-two torpedoes under this contract.

The Bureau desires that the substitution of the new design of depth engine in the Mark III, 5m x 21", torpedoes be expedited as greatly as possible. It is hoped that this design may be completed and tested at a much earlier date than it now appears possible, and while the installation of the modified original design approved by the Bureau is permitted in the above paragraph in all of the forty-two 5m x 21" torpedoes on contract of April 1909, the Bureau re-

590 quests that no more of the original designed modified depth engines be installed than is absolutely necessary in order to continue the tests of torpedoes at Sag Harbor, and that no more of the original designed modified depth engines be manufactured nor work on the same continued than is absolutely required to continue work at Sag Harbor. The necessity of this will be evident since the Bureau does not desire to continue the original designed modified depth engines in the service, and does not wish to be placed at any more expense than is necessary in making this substitution of design for the depth engines.

In the forty-five Mark IV torpedoes being manufactured under contract No. 205 of March 29, 1905, it is recommended that the depth engine be made to conform to the modified design as submitted to the Bureau of Ordnance on blue print No. AA-15-18 (Bureau of Ordnance No. 33565).

It is believed that by this arrangement, the E. W. Bliss Company can proceed with the manufacture of all torpedoes now under contract, and have sufficient torpedoes to keep their testing station running all available time, and develop the design of depth engine for the sixty Mark III torpedoes under contract No. 337, and the

one hundred Mark IV, without any delay and no loss of material except such as may be now on hand for the manufacture of depth engine, which material must necessarily be very small in amount.

Respectfully,
(Sgd.)

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

591

DEFENDANT'S EXHIBIT 151.

April 2, 1910.

SIR: In view of the consideration which the Bureau has been giving to the question of design of depth engine for Mark III torpedoes, we beg to state that we sent one Mark III torpedo to Sag Harbor principally for the purpose of testing out the depth control. We made a few adjustment shots and then after readjusting the gyro, we made two 4000 yard shots and four angle shots, two right and two left. The record of the straight shots follows in detail:

Range	1000 yd.	2000 yd.	3000 yd.	4000 yd.
Speed	28.2 K	28.4 K	27.9 K	26.5 K
Depth	6 ft.	6½ ft.	5 ft.	5½ ft.
Deviation	1 L	8 R	25 R	47 R

Range	1000 yd.	2000 yd.	3000 yd.	4000 yd.
Speed	28.2 K	28.4 K	28.4 K	26.5 X
Depth	6 ft.	6½ ft.	6¼ ft.	5 ft.
Deviation	3 L	4 L	10 L	25 L

The four angle shots, two on each side, followed the above two straight shots in succession and were all successful shots as called for in the specifications, the depth in every case being perfect.

As above stated, in view of the consideration you have been giving the question of the design of depth engines, we believe that the performance of this torpedo particularly as regards the fact that it is controlled perfectly for depth in six successful shots, two straight and four angle, will be of particular interest to you.

Very respectfully,

E. W. BLISS CO., *Vice President.*

592 To Chief of Bureau of Ordnance N. E. Mason, U. S. N.,
Navy Department, Washington, D. C.

(Through Inspector of Ordnance, U. S. N. At Works of E. W. Bliss Co., Brooklyn, N. Y.)

DEFENDANT'S EXHIBIT 153.

Address Bureau of Ordnance, Navy Department, and refer to No. 22569/96 (G).

E. L. B.

WASHINGTON, D. C., April 4, 1910.

OFFICE OF NAVAL INSP'R ORD.,

E. W. BLISS Co., BROOKLYN, N. Y.

Received Apr. 6, 1910.

9.00

a. m.

J. F. H.

SIR: 1. The Bureau acknowledges the receipt of your letter of April 2nd, giving the results of the trials of the first Mark III, 5 m x 21" torpedo fired at Sag Harbor.

2. The Bureau congratulates you on the performance of this torpedo, and notes with interest its performance as to depth, with the modified depth engine.

3. This result the Bureau has anticipated, but is of the opinion that the objections to this design of depth engine as set forth in its correspondence, and by the Torpedo Board recently in session, referring as they do to unbalanced pressures, in either end of the engine's piston, the method of making joint in the bulkhead, and the connection for the air supply still hold good, and that this design is not a satisfactory one to be placed in service, since the very faults that cause these objections would be greatly augmented by wear of the parts in service.

593

DEFENDANT'S EXHIBIT 153.

4. The Bureau notes with pleasure the prompt submission of the new design by your Engineer, Mr. Leavitt, which seems to meet all the objection to the present design, and hopes that an engine of this design may be completed and tested as soon as possible, in order that no more Mark III torpedoes need to fitted with the original design than is absolutely necessary.

5. The Bureau expresses the hope that nothing will delay the trial and delivery of the Mark IV, 5m x 45c.m. torpedoes, as they are urgently needed at the present moment in the service.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

B.

The E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

(Endorsed on back of letter:) Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co., No. 17 Adams St., Brooklyn, N. Y. April 6, 1910. Respectfully forwarded, J. G. Hellweg, Lieutenant U. S. N. Insp'r Ord.

594

DEFENDANT'S EXHIBIT 154.

Address Bureau of Ordnance, Navy Department, and refer to No. 22569/92 (G).

E. L. B.

DEPARTMENT OF THE NAVY,

BUREAU OF ORDNANCE.

WASHINGTON, D. C., April 6, 1910.

9:30

Office of Naval Insp'r Ord.,

a. m.

E. W. Bliss Co., Brooklyn, N. Y.

Received Apr. 7, 1910.

SIRs: Replying to your letter of March 29, 1910, submitting a new design depth engine suitable for Mark III, 21" torpedoes:

1. The Bureau confirms its telegram of April 2nd, to the Inspector of Ordnance at your Works, as follows:

"New design depth engine, Mark III, torpedo submitted by Bliss Company approved as substitute for present design. Bureau directs manufacture of one for test as soon as possible.—Mason."

2. The Bureau thanks you for the prompt submission of this design to meet the faults as set forth by the Torpedo Board, and requests that the manufacture and test of an engine of this design be expedited, in order that no more of the present design depth engines will be installed in the Mark III torpedoes than is absolutely necessary.

Respectfully,

N. E. MASON,

Chief of Bureau of Ordnance.

B.

The E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance.)

595

(Endorsement on back of letter:) Office of Inspector of Ordnance, Torpedo Works of E. W. Bliss Co., No. 17 Adams St., Brooklyn, N. Y., April 7, 1910. Respectfully forwarded, J. G. Hellweg, Lieutenant U. S. N., Insp'r Ord.

COMPLAINANT'S EXHIBIT 62.

(No. 22569/114.)

E. W. Bliss Company,
Brooklyn, New York.

April 28, 1910.

SIR: In reply to the Bureau's letter of March 31st, upon the subject of depth engines and matters incident thereto beg to state in

accordance with the Bureau's instructions we have designed, installed and tested in a Mark III torpedo the new design of depth engine, which design meets the objections of the Bureau both as to unbalanced pressures and the method of making joint in the bulk head and connection for the air supply. The work of making special jigs and tools for the manufacture of this new type of engine has been progressing rapidly, and we expect in a few weeks to begin manufacturing the new type and installing same. It is difficult to state definite time when this new type of engine will begin to be installed, but we can assure the Bureau that everything possible is being done to expedite matters, appreciating as we do the Bureau's desires to

596 install the new type just as soon as practicable. In accordance with the Bureau's instructions we are fitting up first forty-two Mark III with the improved old type depth engine; also the forty-five Mark IV. With regard to the cost of changing the depth engines on the Mark III to this improved old type would state that cost is a very small matter, and we will make no charge for same to the Bureau. With regard to the cost of making and installing new type of depth engine in the Mark III, would say we cannot tell at this writing just what the cost will be, but outside of the cost of some few jigs and tools, it has been necessary to make the actual manufacturing cost will be, we believe, very light. We, however, will present information to the Bureau in regard to this matter at the earliest possible date.

In regard to delay which has been caused due to discontinuance of shop test inspections during the Bureau's consideration of design of depth engine, would state that this delay was from February 16th to March 31st. We do not know at this writing that it will be necessary for us to have an extension of time on the contract, on account of this delay, for which, of course, we are not responsible, but we merely at this time want to record the delay, and will defer making any request for extension until later date, at which time we can better judge as to whether we will need it. We understand that it is the Bureau's desire that no more of the modified original design depth engines be installed than absolutely necessary in order to continue the test at Sag Harbor.

Very respectfully,

E. W. BLISS CO.

F. C. B. PAGE,

Vice-President.

Admiral N. E. Mason, Chief of Bureau of Ordnance, Navy Dept.,
Washington, D. C.

(Through Naval Inspector of Ord.)

597

COMPLAINANT'S EXHIBIT 75.

E. W. Bliss Company,

Brooklyn, N. Y.

17761/314-1-2

July 12, 1910.

SIR: With reference to contract for 300 21" torpedoes, Mark I and II types, we beg to confirm arrangements made with the Bureau to the effect that contract be closed out on the basis of delivery of 293 torpedoes, all of which, excepting three, have passed their acceptance test at Sag Harbor, and are now ready for delivery, it being understood that as soon as matters at Sag Harbor will permit of our testing out the remaining two Mark II torpedoes, the Bureau will consider taking them as a separate proposition entirely from the contract.

In connection with this contract, as the writer advised Commander Norton, the bad weather we have encountered since the last extension granted by the Bureau by letter of February 19, 1908, up to the opening of the Station this Spring, amounted to 305 days, which in itself, without considering the bad weather since that time, carries the delivery date somewhat beyond the present time. Monthly reports as to the bad weather delays have been furnished the Bureau.

We will be glad to have the Bureau's authorization along the above lines in due course.

Very respectfully,

E. W. BLISS CO.

F. C. B. PAGE.

Vice-President.

Admiral N. E. Mason, Chief of Bureau of Ordnance, Navy Dept., Washington, D. C.

Through Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn, N. Y.

598

COMPLAINANT'S EXHIBIT 14.

24245 (G).

E. L. B.

Confidential.

April 3, 1911.

SIRS: 1. The Bureau invites your attention to the following extract from official report brought to its notice:

"I have information * * * that negotiations are pending with the Japanese Government for a supply of Bliss torpedoes for the Navy; and that a proposition is to be made by which the manufacture of this torpedo is to be undertaken by the Japanese Government. * * * "also stated that the Japanese Government had been making every effort for the past year to ascertain what im-

provements had been made in torpedoes in use in the American Navy."

2. In view of the fact that Navy Department controls patents for balanced turbines used in the Bliss-Leavitt torpedoes, and that there are other devices used in the Bliss-Leavitt torpedo which fall under the provisions of Clause 19 of the later contracts with your Company. The Bureau will be pleased to receive a statement as to the accuracy of the report quoted in the first paragraph above.

3. Should such negotiations as are mentioned in the above quoted report be in progress, the Bureau would be please to be informed whether or not the torpedoes under such negotiations contain the devices covered by patents controlled by the Navy Department or which fall under the provisions of Clause 19.

4. An early reply will be appreciated.

Respectfully,

E. E. CAPEHART,

Acting Chief of Bureau of Ordnance.

The E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance, U. S. N.)

599

COMPLAINANT'S EXHIBIT 13.

E. W. Bliss Company,

Brooklyn, New York.

April 5, 1911.

SIR: In reply to the Bureau's letter No. 24245 (G) of the 3rd inst., we beg to respectfully state that as such matters are confidential, we regret that we feel barred from advising the Bureau as to the correctness of the Official report to which the Bureau refers.

2. Referring to paragraph two (2) of the Bureau's letter, we understand that the Navy Department controls a certain United States Patent on the balanced turbine but this Company controls several foreign patents on this device, among which is one issued by the Japanese Government.

3. Without regard to any negotiations which may or may not be pending, and in order that we may not inadvertently perform any act which would interfere with the rights of the Navy Department, we respectfully request that the Bureau state specifically what device it refers to as coming under clause 19 of the contract.

This clause provides that "no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at any time when the said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

600 We are unable to find from our files any such communication, and respectfully request that the Bureau examine its own files and advise us.

3. As the Bureau has brought up the subject of patent rights, we respectfully call its attention to our U. S. Patent No. 693872 of February 25th, 1902, and request that it respect our rights under this patent. The Bureau has in the past infringed this patent by importing foreign torpedoes containing the device covered by it, and has recently placed certain orders for torpedoes, which will in all probability contain the infringing device.

We also respectfully call the Bureau's attention to our U. S. patent No. 748759, January 5th, 1904, which, in addition to the above mentioned patent is, to the best of our belief being infringed in the case of the two experimental long range torpedoes contracted for by the Bureau in competition with the two now being built by us.

We believe it to be a reasonable request that the Bureau notify the contractors supplying those various torpedoes that they must omit the use of these infringing devices or else that the Bureau lawfully acquire the right to use them by paying us royalty.

Respectfully,

E. W. BLISS CO.
F. M. LEAVITT.

(Through Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn, N. Y.)

601

COMPLAINANT'S EXHIBIT 12.

24245/3 (G)

E. L. B.

April 24, 1911.

1. The Bureau acknowledges receipt of your letter of April 5, 1911, and thanks you for the information contained in the first and second paragraphs therein.

2. In regard to paragraph 3 of the above letter, the Bureau begs to inform you that in its endorsement No. 20361/3 of January 9, 1907, paragraph 2, it stated, "The balanced turbine falls under the provisions of Clause 19 of the contract for the manufacture of 21-inch torpedoes." This endorsement was referred to your office by Inspector of Ordnance's file No. 230 of January 10, 1907, and the stamp of your office on the face of this letter shows it to have been received by you at 2:30 P. M., January 10, 1907.

3. Bureau's letter No. 17761/117 (G) of September 21, 1906, directed that its design for a nipple for superheater pot be fitted to the two hundred and fifty (250) Bliss-Leavitt 5m x 21-inch Mark I torpedoes under Clause 19 of that contract. The Company's stamp on the face of this letter shows that it was brought to your cognizance at 4 P. M., September 24, 1906.

4. Referring to paragraph marked 3, but evidently intended for paragraph 4, with reference to patent 693,872 of February 25, 1902, the Bureau begs to inform you that the superheaters which are being used in the torpedoes manufactured in this country are purchased from the E. W. Bliss Company and that royalties are paid thereon.

5. Referring to that portion of your letter which refers to torpedoes

602 purchased in this country and abroad by the U. S. Government, you are informed that the U. S. Government is held harmless and protected by the contractors against any and all demands for the use of any device, process or article in these torpedoes, or in the manufacture thereof.

N. E. MASON,
Chief of Bureau of Ordnance.

The E. W. Bliss Company, Brooklyn, N. Y.
(Through Inspector of Ordnance, U. S. N.)

COMPLAINANT'S EXHIBIT 11.

Ord. No. 26775/6.

E. W. Bliss Company,
Borough of Brooklyn, New York.

December 10, 1912.

SIR: In reply to your message of the 9th inst., we beg to say:

1. We should exceedingly regret taking any action which could be construed as being hostile to the Bureau's interests. In view of rights claimed by us and conceded in Clause 2 of the contract, we did not consider that our invitation to visitors to inspect the torpedoes, which are our property, could be so construed.

2. We cannot see any ground on which the turbine used by us in the Mark VII torpedo can be considered as coming under the provisions of Clause 20 of the contract for the following reasons:

1st. As to the Davison patent, the first turbine driven torpedo ever constructed was designed and built by us in the year 1898. In designing this torpedo the writer feared the effect of gyroscopic
603 action, and for this reason arranged the turbine rotors to revolve in opposite directions. The design of this turbine is in many respects quite similar to that used in the present Mark VII torpedo. The drawings of this turbine are available for inspection.

It will be manifest from the above, that if any reason existed for overthrowing the Davison patent, this could be easily accomplished.

2nd. In the year 1903, when the first contract with the Bureau for Bliss-Leavitt torpedoes was under discussion, the writer made certain experiments which convinced him that the errors due to gyroscopic action were theoretical rather than practical, and for this reason, a turbine with rotors turning in the same direction was adopted. This arrangement was adopted because of simplicity of design in spite of the fact that the principles of gyroscopic action were quite well understood and were freely discussed by the writer with Mr. Davison and other naval officers. In the summer of 1906 we altered the design of the turbine so as to cause the rotors to revolve in opposite directions and this design was tested out at Sag

Harbor in the same year. It was adopted as the standard of all torpedoes then on order.

In January of 1907 we received a blue print from the Bureau, which was a copy of the drawings of our original design of turbine but altered sufficiently to cause the rotors to revolve in opposite directions.

As we had already adopted our own design, and as Mr. Davison's method of making the change did not appear to us to be very practical, we never used it, and this design was never introduced in any torpedo made by us. The blue print furnished us by the Bureau was not accompanied by any notification that the Bureau 604 wished their design adopted in the torpedoes then under construction, nor by a notification that it came under Clause 19 of the then existing contract, as provided in that Clause.

3rd. The distinctive features of the Davison patent is clearly stated in the clause to be the balancing of the oppositely rotating elements so that the sum of their movements of inertia shall be zero. We have never furnished a turbine to the Bureau in which this was the case. As the writer had long since thoroughly convinced himself that the gyroscopic effect of the rotors was inappreciable, no attention has been paid to this point, and as a matter of fact, in none of them does it exist.

4th. Clause 20 of the contract was manifestly intended to protect the Government in the sole use of any design furnished by it, and to prevent the same from being used by others.

The balanced turbine was patented by Mr. Davison both in the United States and in several foreign countries, thus being published to the world.

The Bureau of Ordnance acquired we believe the United States patent, and we purchased all rights under foreign patents. It is inconceivable that Lieutenant Davison would have committed so grave a breach of propriety as to sell us rights which could and should in the Bureau's judgment have been kept secret.

3. In view of the fact that the contract, in clause 2, concedes to us the ownership of the general design of the torpedo, and since we own the foreign rights to the balanced turbine by right of purchase, we believe we are correct in assuming that the objection raised by the Bureau refers only to exhibitions made in the United States of the balanced turbine and not to those made in foreign countries 605 tries where we own the whole of the rights and the United States Government owns none.

If therefore the Bureau insists that we surrender what we feel confident is our right to exhibit our torpedo in the United States, it would appear that no consequent advantage will accrue to the Government. Incidentally some advantage might accrue, to us, due to the impression made on our visitors, but this will be offset by the embarrassment of having to refuse showing what we have invited them to see. It will also cause us some inconvenience to be forced to do abroad what we would do more easily at home.

4. Under all the circumstances therefore we request that the Bu-

reau give us its sanction to exhibit the torpedo here and not force us to take it abroad.

Respectfully,

F. M. LEAVITT,
E. W. BLISS CO.

Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Through Naval Inspector of Ordnance, Works of E. W. Bliss Co., Brooklyn, N. Y.

606

COMPLAINANT'S EXHIBIT 10.

26775/6 (G)-0.

A.L.N.-E.L.B.

Department of the Navy,
Bureau of Ordnance.

Dec. 13, 1912.

SIRS: 1. The Bureau acknowledged the receipt of your letter of December 10, 1912, being a reply to the Bureau's telegraphic message on the subject of demonstration of torpedoes before the English representatives of the Whitehead Torpedo Works, Weymouth, England, and Fiume, Austria.

2. The Bureau regrets that it can in no way modify the restrictions contained in Clause Twentieth of the contracts under which torpedoes are being manufactured by the E. W. Bliss Company, and regrets also that it must insist upon these restrictions being complied with in their broadest and most complete sense, in that no device containing turbine engines of the so-called balanced turbine principle with rotors revolving in opposite directions shall be in any way exhibited or described or any information given in regard to it to any person, persons, firms, corporations, or others, or to other Governments or their representatives other than the United States; and that no torpedo containing this device shall be exhibited either in shop or service tests to any person, persons, firms, corporations, or others, or to other Governments or their representatives other than the United States.

3. The Bureau of Ordnance in its letters of November 9, 1906, No. 17761/128 (G), paragraph 4, informed the E. W. Bliss Company that,

607 "The Bureau will furnish the E. W. Bliss Company at a later date with plans of balanced turbines turning in opposite directions, which is the principle of the new mechanism, and the Bureau desires that the balanced turbine principle in torpedoes be considered as falling under the provisions of Clause 19 of the Contract for these torpedoes."

On January 9, 1907 (endorsement No. 23061/3 (G) there were forwarded to the E. W. Bliss Company two blue prints of drawing No. 177-E, design of balanced turbine gears which were then building at the Washington Navy Yard, and in the 2nd paragraph of

this endorsement again informed the E. W. Bliss Company that "the balanced turbine principle falls under the provisions of Clause " 19 of the contract for manufacture of torpedoes." The stamp of the Bliss Company shows the letter and endorsement to have been received by them and the blue prints delivered. Clause Nineteenth was at that time an exact counterpart of Clause Twentieth now operative.

4. Referring to Clause Second referred to in your letter of December 10, 1912, the Bureau quotes:

"That nothing in this Clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other government whatsoever, except as limited by Clause Twentieth of this contract."

A careful reading of this clause and of Clause Twentieth will indicate that the rights claimed by the E. W. Bliss Company in paragraph 1 of their letter of December 10th, above referred to, are not conceded by the Bureau or the Department or by the contract.

5. The Bureau states the following facts, with which you are no doubt conversant—

The U. S. Government is the sole owner of the full rights
608 for the United States of patent applications No. 339,710, filed October 19, 1906, and allowed December 6, 1906, covered by patent No. 858,266, issued June 25, 1907, and No. 344,977, filed November 24, 1906, covered by patent No. 858,156, issued June 25, 1907.

6. Patent No. 858,266 covers the question of the so-called balanced turbine principle in torpedoes. The Bureau desires to invite attention to the fact that the use of any torpedo containing this device covered by the parent patent quoted falls within, by a recent decision of the Supreme Court, the full control and jurisdiction of the original owner of the parent patent, the U. S. Government in so far as concerns any manufacture, demonstrations, or other uses within the limits of the United States.

7. On the above facts which are easily verified the Bureau, acting for the U. S. Government, bases its decision not to allow any demonstrations of your torpedoes to representatives of foreign governments, or of foreign manufacturers for foreign governments, and invites your attention to the fact that the Bureau is credibly informed that this visit of the representatives of the Whitehead Torpedo Works of Weymouth, England, and Fiume, Austria, to this country is for the purpose of obtaining information regarding the United States implements of war, without which information they are practically at a standstill in so far as progress is concerned in obtaining range, speed, and direction in torpedoes, and that the obtaining of such information by these representatives of foreign manufacturers would place the United States decidedly at a disadvantage, whereas at the present time the U. S. Government occupies a position of decided advantage, and for this reason alone, were

609 there no other legal rights vested in the U. S. Government than those given to the Government by Acts of Congress for the Government's protection, the Bureau would be compelled to insist upon the full operation of the restrictions imposed by Clause Twentieth of Contracts with your firm.

8. You are informed that the Navy Department believes that the restrictions imposed by Clause Twentieth are so far reaching as to prohibit the exportation, without the Government's sanction, of any device that may be used for war purposes manufactured in this country embodying the principle of balanced turbines, to any country for the purpose of demonstration, and you are requested to refrain from such action.

Respectfully,

N. C. TWINING,
Chief of Bureau.

E. W. Bliss Company, 17 Adams Street, Brooklyn, N. Y.

(Through Naval Inspector of Ordnance.)

610

COMPLAINANT'S EXHIBIT 9.

Bu. Ord. No. 27741/1.

E. W. Bliss Company,

Brooklyn, N. Y.

December 19, 1912.

SIR: In conformity with your suggestion to the writer when in Washington yesterday that we submit for consideration a definite proposition under which the Bureau could acquire exclusive rights to our Bliss-Leavitt torpedo, beg to state that we will agree to sell to the United States Government the exclusive right to the use of our Bliss-Leavitt torpedo for the whole world for \$1,500,000.00 cash. We would also make any guarantee within our power in connection with keeping the torpedo, or any later development in connection with the same, secret and for the Government's use exclusively.

The amount we now ask is the same as was considered by the Government in connection with the purchase of these rights several years ago, and while we consider the rights of much greater value to us than they were at that time, due to the developed and superior condition of the torpedo today, yet we are willing as above indicated, to accept that figure.

The consideration which caused the Government some years ago to decide that it could not control the torpedo as a secret weapon was the fact that various patents covering principles of the torpedo, had been published to the world and consequently were a matter of public knowledge. We believe in view of the history during the last number of years in connection with the development of this torpedo that it has been clearly demonstrated that the publication

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611 of those patents or later patents in no way prevented the matter from being kept secret. This is instanced by the fact which the Bureau has very clearly stated to us that although the Foreign manufacturers and Governments have used every endeavor to produce a torpedo similar to ours abroad, they have been unable to do so, the result being today that the Government through our efforts is in a most advantageous position as regards torpedoes compared to the other Powers.

We believe the Bureau could be well protected in an exclusive right and through such a right be well assured of maintaining its present great advantage over other Foreign Powers. We will be glad to inform the Bureau or any Board that may be appointed to look into the question, as to the many reasons which would tend to insure to the Bureau a large measure of protection.

We believe the Bureau is aware of the situation as regards the desire of Foreign Governments and torpedo manufacturers to acquire the rights from us for our torpedo and consequently are obliged to request, in order that we may lose no unnecessary time in connection with the Foreign field, that prompt action be taken in acting on our proposition.

Yours respectfully,

E. W. BLISS CO.,
F. C. B. PAGE,
Vice-President.

E. P.

Admiral N. C. Twining, Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

(Through Naval Inspector of Ordnance, Works E. W. Bliss Co., Brooklyn, N. Y.)

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COMPLAINANT'S EXHIBIT 8.

Bu. Ord. No. 27741/2.

E. W. Bliss Company.

BROOKLYN, N. Y., December 30, 1912.

SIR: Confirming the writer's telephone talk with you this afternoon, we desire to emphasize the desirability of the Department's taking prompt action on our proposition of Dec. 19/12., covering certain exclusive rights to our Bliss-Leavitt Torpedo.

Before making this proposition to the Department, we had already made certain engagements with foreign Governments and manufacturers to demonstrate our torpedo to them and it is very desirable in consequence of these engagements that we should know with as little delay as possible, as to the attitude of the Department toward the propositions we have made.

Our proposition has now been in the Department's hands for ten days.

We trust we may be informed very promptly as to its wishes in the matter and remain,

Respectfully,

E. W. BLISS CO.,

F. C. B. PAGE,

Vice-President.

Admiral N. C. Twining, Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Through Naval Inspector of Ordnance, Works E. W. Bliss Co., Brooklyn, N. Y.

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COMPLAINANT'S EXHIBIT 64.

Navy Department.

25698/92 (G)-1/15.

Jan. 4, 1913.

SIR: Referring to your letter of December 12, 1912:

1. The Specifications for Mark III torpedoes dated June 10th and November 15, 1910, and for the Mark VI torpedoes dated October 1909, under the heading "Dynamometer Tests" were as follows:

* * * * *

4. With the meaning thus clearly established there can be but one reading of the specifications in question, sub-paragraph (h), Clause 86, for the Mark VII torpedo, i. e., that the torpedo when run in the dynamometer tank shall be so regulated as to performance that at no time after it shall have been run in the tank for an interval of time which would permit it to cover one hundred and twenty (120) yards if in free route shall the horse power fall below 105 or rise above 120, and as a further evidence of the intent and meaning of this clause of the specifications it is evidenced that the limits of 105 horse power and 125 horse power were set by the contractors.

5. It would seem also more reasonable to consider what a dynamometer test is for, and it would seem utterly unreasonable to specify that in any dynamometer test only one point of the curve of the record is considered. This dynamometer test has been required in practically all contracts, its object sometimes stated and at all time recognized. Long series of dynamometer tests have been made at the works of the E. W. Bliss Company and others have been made at the Naval Torpedo Station. The main objects of these dynamometer tests has been to obtain a continuous horse power curve of the torpedo. In fact the most expensive part of the equipment of a dynamometer is to achieve this very object. An acceptance of the interpretations of the contractors of paragraph 87 (h) would render the test useless.

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6. In regard to the contention of the contractors that the speed on the range should be the criterion, it would seem that these cards are themselves the answer. These torpedoes might very well show the same speed between the 2,000 yard and 3,000 yard buoys as between the 3,000 and 4,000 yard buoys, and yet be going down the range in a series of jumps which would be destructive of any efficient depth performances. Uniform speed is desirable for two reasons, first, in order that the ratio between the speed of the target and the speed of the torpedo may be constant for all ranges, and, second that the pendulum which exercises so much control on the depth, shall not be subject to perturbations. The statement of the contractors that the resistance of the dynamometer and the speed of the turbines due to that resistance and to the setting of the regulator do not bear any connection to the corresponding elements when the torpedo is in free route may be technically correct, in so far that the contractors have not yet established the mathematical formula with absolute precision connecting the data derived from the dynamometer tank and the data derived from the range trials, but such a relation does exist and, while there are other things affecting speed besides the horse power of the torpedo, if we can once obtain a torpedo which shows an absolutely uniform output of horsepower during the entire run, we will have made a great step towards obtaining uniform speed in free route, and at the same time would have removed a primary cause of direction eccentricities. It is believed that in this instance the contractors are arguing against their own interests. Should they install in their torpedo an efficient regulator the operating expenses at Sag Harbor would be largely reduced. It has been found at the Torpedo Station, and its experience in this matter has been paralleled by that of the Whitehead Torpedo Company of Fiume that the proper regulation of steam torpedoes is more difficult than that of hot air torpedoes. This should have been expected due to the introduction of a third variable. The experiments at the Torpedo Station have indicated an improvement in regulation by the use of two reducing valves, and the experience at Fiume has led the Whitehead Company to use double regulation, a practice which obtains with the Schneider Company also.

615 7. It is possible by the use of proper regulating devices to maintain during the dynamometer test an output of horse power by the engines of the torpedo within the wide limits set in these specifications, and if this regulation of performance is obtained on the dynamometer test an equal regulation of speed may be expected from the torpedo when in free route in the water.

8. In view of the above the Bureau must require that such steps be taken as will insure the proper dynamometer tests within the limits specified being accomplished for the purpose of indicating what performance of the torpedo in the water may be expected.

9. The Bureau is ready to co-operate with the E. W. Bliss Company in producing an engine regulator, and it is believed that this

should be undertaken before any further torpedoes are submitted for test.

Respectfully,

N. C. TWINING,
Chief of Bureau of Ordnance.

E. W. Bliss Company, Brooklyn, N. Y.

(Through Inspector of Ordnance.)

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COMPLAINANT'S EXHIBIT 65.

Bureau of Ordnance,
Navy Department.

25698/102-(G)-O.

January 18, 1913.

SIRS: 1. The Bureau is pleased to note the decided improvement shown in the dynamometer tests of the Mark VII torpedo by the use of double regulating valves.

2. This plan or idea of double regulation was first submitted to the Bureau by a letter from Lieut. E. Frederick, then Assistant Inspector of Ordnance at your works, dated March 9, 1911, which was received and filed in this office on or about March 15, 1911, and the value of the invention was successfully established by the actual tests at the Naval Torpedo Station, Newport, R. I.

3. The Bliss Company had been furnished verbally with the idea and the fact that its value had been established by actual trials. This was also furnished the E. W. Bliss Company by the Bureau's letter No. 25698/92(G) of January 4, 1913.

4. In view of the above the Bureau requests that you will note for record that the double regulating principle has been submitted by the Bureau, and that this principle of any device embodying the same falls under the provisions of Clause 20 of the contracts now existing.

5. While the Bureau has no actual blue prints of design it has on record cards and certain data obtained by experiments at the Torpedo Station which the Bureau will be pleased to furnish the E. W. Bliss Company for their information if they so desire and will request it.

6. The Bureau again desires to express its pleasure in
617 noting the improvement in the dynamometer tests due to the double regulation and the change in angle spray which was introduced at the suggestion of the Bureau's inspectors at your works.

Respectfully,

N. C. TWINING,
Chief of Bureau.

E. W. Bliss Co., Brooklyn, N. Y.

(Through Inspector of Ordnance.)

COMPLAINANT'S EXHIBIT 7½.

27741/1 (G)-0.

Bureau of Ordnance,
Navy Department,
Washington, D. C.

January 25, 1913.

SIR: Confirming the Bureau's telegram of January 10, 1913, to the Naval Inspector of Ordnance at your Works:

1. The Bureau quotes below the decision of the Navy Department on the subject of balanced turbines:

"The use by the contractors of the balanced turbine device in any torpedo constructed for any party or Government other than the United States, or the exhibiting, describing or giving of information in regard to it, or the exhibiting of the performance of any torpedo containing it, to any such party or Government wherever the act may be done, would in the Department's judgment constitute a breach of the condition for which the penalties prescribed may be imposed and such equitable remedies invoked as may be necessary to protect the interests of the Government."

Respectfully,

FRANK A. CLARK,
Acting Chief of Bureau.

E. W. Bliss Company, Brooklyn, N. Y.
(Through Naval Inspector of Ordnance.)

COMPLAINANT'S EXHIBIT 7.

Ord. No. 27741/5.

E. W. Bliss Company,
Brooklyn, N. Y.

Feb. 10, 1913.

SIR: With reference to the Bureau's letter of January 25th, quoting the decision of the Navy Department on the subject of balanced turbine, we desire to inform the Department that we have been advised by very eminent counsel that the decision of the Department in connection with the matter is not warranted by the facts and would not be sustained in a Court of Law.

In submitting our offer for the acquisition of exclusive rights by the Government to our torpedo, we first notified the Bureau that we could not be bound by the Department's decision which had already previously been forwarded to us.

We are desirous of being in full accord with the Department, but in view of the legal advice we have had on the subject, we as above stated, cannot be bound by the Department's decision and consequently suggest that a conference be arranged for between the De-

partment's advisers and our own to the end that both sides of the question may be fully discussed and if possible an agreement reached as to our rights to exploit our torpedoes abroad.

If there are any facts in connection with the matter which either side may not be aware of a conference such as we suggest should be helpful in justly determining this Company's right.

We will be glad to learn from the Department that our suggestion meets with its approval and remain,

Yours truly,

E. W. BLISS CO.,
F. C. B. PAGE,
Vice President.

Chief of Bureau of Ordnance, Navy Department, Washington,
D. C.

Through Naval Inspector of Ordnance, Works of E. W. Bliss, Co.,
Brooklyn, N. Y.

1st Indorsement.

27741/5 (G)-2/25.

A. L. N.-E. L. B.

February 15, 1913.

From: Chief of Bureau of Ordnance.

To: Secretary of the Navy.

(Office of Solicitor.)

Subject: E. W. Bliss Company—Suggest Conference Relative
Balanced Turbine Principle in Torpedoes.

1. Referred to information and recommendation.

2. This Bureau recommends that before a conference is decided upon between the legal representatives of the E. W. Bliss Company and the legal representatives of the Navy Department, the E. W. Bliss Company submit a brief outlining their position with reference to the subject in question.

3. Return of letter is requested.

TWINING.

S./M./Dr.

2d Endorsement.

17755-14:2.

From Acting Secretary.

To: Bureau of Ordnance.

Subject: E. W. Bliss Company, 2/10/13, Suggest Conference Regarding Exploitation Abroad of Torpedoes Embodying Principle of Balanced Turbines.

Returned. with a copy of the Department's letter of this date to the E. W. Bliss Company, suggesting, as recommended by the Bu-

reau, that they submit a brief outlining their position with regard to the question at issue.

WINTHROP.

COMPLAINANT'S EXHIBIT 66.

E. W. Bliss Company.

BROOKLYN, N. Y., Feb. 17, 1913.

SIR: We desire to inform the Bureau that we, have, after much time and consideration, been able to design a double pressure regulating device, which is possible of installing in the 18-inch torpedo without necessitating changes in any of the existing parts, other than the valve group.

621 We have this double regulator device in course of construction at the present time and expect, barring unforeseen delays, to have same ready for inspection by the Bureau's inspectors in a few days.

We would also add that while the present type meets, in our judgment, the conditions of the specifications, we have at the same time discontinued work on the single regulating devices in order that, should the Bureau decide to have the double regulator installed, the additional cost will not be more than necessary as we have already a large number of the single regulators finished or under way and the work on the contract will not be delayed through our holding up the work at the present time on these single regulators, pending the decision by the Bureau in connection with the matter.

The great difficulty of course has been to so design the double regulator that it could be installed in the 18-inch torpedo and being so designed, it is of course applicable to the large size of torpedo.

Very respectfully yours,

E. W. BLISS COMPANY,
F. C. B. PAGE, *Vice President*.

Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Through Naval Inspector of Ordnance, Works E. W. Bliss Co., Brooklyn, N. Y.

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COMPLAINANT'S EXHIBIT 67.

25698/127.

E. W. Bliss Company,
Brooklyn, N. Y.

Feb. 18, 1913.

SIR: We are in receipt of the Bureau's letter of January 18, 1913, concerning a "plan or idea of double regulations," and stating that this idea has been furnished to us verbally, and requesting us to note that this "double regulating" principle falls under the provisions of Clause 20 of the contracts now existing.

We beg to inform the Bureau that we cannot accept the Bureau's interpretation of Clause 20 of said contracts.

In our view of Clause 20 it applies only to "any device" the design for which is furnished to us by the Bureau. We especially direct the Bureau's attention to the proviso of Clause 20 that "no device or design shall be considered as coming within the provisions of this clause unless the Bureau shall state to us in writing at the time when the said device is itself conveyed to us, that the Bureau considers that the said device or design is expressed within the provisions of this clause.

We regard it as perfectly clear from the language of the contract that it has no application to mere intangible ideas or principles, and that it applies solely to a device embodied either in a model, or in a working drawing constituting a design illustrating such device. Furthermore we regard it as necessarily implied by the language of the contract that the device or design to be furnished to us by the

Bureau in order to be covered by said clause must be one of 623 which we are not already in possession, and must be something essentially novel, since obviously to include matters of common knowledge or ordinary shop expedients, would be contrary to the spirit of the contract. It clearly was not intended that this clause should entitle the Bureau to notify us of things already known or used, or of mere intangible ideas and thereby to put us under any restriction concerning such things. In our view the intent of the clause in question was that in the event that the Bureau should at any time work out any new improvement and embody it either in an operative device or in a drawing or design of such device, and should communicate it to us, that such device or design should be within the prohibition of Clause 20th, if the proviso giving us notice thereof was also complied with. Any interpretation obligating us beyond this we cannot accept.

In our view the matter communicated in the Bureau's letter of January 18, 1913, does not come within the provisions of Clause 20.

Very respectfully,

E. W. BLISS CO.,
F. C. B. PAGE,

Vice President.

Chief of Bureau of Ordnance.

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COMPLAINANT'S EXHIBIT 6.

17755-14:2.

Navy Department,
Washington.

February 18, 1913.

GENTLEMEN: There has been received by reference from the Bureau of Ordnance your letter of the 10th instant suggesting conference between representatives of your company and of the Department with regard to your claim of the right to exploit abroad torpedoes embodying the principle of the balanced turbine.

The Department would be pleased to have a full discussion of this matter, but before arranging for a conference would suggest that you submit in writing a brief outlining your position with regard to the question at issue.

Very respectfully,

BEEKMAN WINTHOP,
Acting Secretary.

E. W. Bliss Company, Brooklyn, N. Y.

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COMPLAINANT'S EXHIBIT 5.

(Ord. No. 27741/6)

E. W. Bliss Company,
Borough of Brooklyn, New York.

May 9, 1913.

SIR: Referring to contract dated June 12, 1912, between our company and the United States, for the manufacture of 120 torpedoes for the U. S. Navy.

Said contract in Article "Second" expressly recognizes our right to make and sell such torpedoes (known as the Bliss-Leavitt torpedoes) to any other party or Government, except as limited by Article 20th of the contract. Article "Twentieth" requires us to make no use of and not to exhibit or disclose "any device the design for which is furnished to" us by the United States.

Under Article "Twentieth" the Bureau of Ordnance has repeatedly insisted that we have not the right to exhibit or demonstrate, or to manufacture or sell to foreign concerns or Governments, the Bliss-Leavitt Torpedo containing two oppositely revolving turbines, commonly known as the "balanced turbine," claiming that the principle of such turbine was communicated to us by the Bureau and was reserved under that Article of the contract.

We have repeatedly insisted that said article of the contract did not apply for the protection of any principle, but merely to "any device the design for which" was furnished to us by the Government; that the specific design furnished has been and will be kept secret; that the "principle" having been made public by the grant by the Government of a patent for it, which patent the Government afterwards purchased, the "principle" of the balanced turbine is
626 no longer a confidential matter, and we cannot be held to a secrecy which the Government has itself waived; and that as we hold the patent rights for foreign countries for precisely the same invention of the balanced turbine that is owned by the United States Government in this country, we have the right to exploit this invention abroad; and accordingly that "Article Twentieth" of the contract cannot be construed to restrain us from making sales of the Bliss-Leavitt torpedoes abroad, when that right is expressly reserved to us by Article "Second" of the contract.

We have been in negotiation with Messrs. Whitehead & Company concerning the sale of our rights to manufacture the Bliss-Leavitt

torpedo in certain foreign countries. Thus far in deference to the views of the Bureau of Ordnance, we have deferred exhibiting this torpedo to them or others abroad. If we should, however, much longer defer these negotiations, it would be at a very considerable loss to our Company, since the development of the Bliss-Leavitt torpedo and its protection by patents in foreign countries has been the subject of very heavy expense extending over many years, and our foreign patent which should yield us an adequate return would become valueless. We have heretofore suggested that in order to meet the expressed desire of the Bureau of Ordnance to monopolize for the United States Navy the admittedly peculiar excellence of the Bliss-Leavitt torpedo, we would forego the exercise of our foreign rights, and sell same to the United States for a sufficient consideration, and we have made a definite proposition to this end which has not been accepted.

627 In justice to our own interest we cannot defer our foreign negotiations much longer. We desire to have the point at issue amicably adjusted if possible, but the divergence of views as to the interpretation of the contract appears to be irreconcilable. It seems to us the matter should be submitted to judicial decision. We should gladly co-operate with your Department in presenting the question at issue to a Court of competent jurisdiction at the earliest practicable date.

As a means to this end we notify you hereby that it is our intention to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and to make a demonstration of the operation of said torpedo to a representative of Messrs. Whitehead and Company on or immediately after June 1, 1913.

This notification on our part will afford your Department the necessary evidence on which, if you regard our proposed action as a breach of contract, to apply to the United States District Court, having jurisdiction to enjoin us from such threatened action.

Very respectfully,

E. W. BLISS CO.,
F. C. B. PAGE,
Vice President.

Hon. Secretary of the Navy, Navy Department, Washington, D. C.

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COMPLAINANT'S EXHIBIT 1.

*Contract for the Manufacture of 300 Torpedoes for the U. S. Navy,
Bliss-Leavitt 5-Meter, 21-Inch, Mark I.*

Contract, of two parts, made and concluded this 22nd day of November, 1905, by and between the E. W. Bliss Company, a corporation created under the laws of the State of West Virginia, and doing business in the City of Brooklyn, State of New York, represented by James W. Lane, the president of said company, party of the first part, and the United States, represented by the Chief of the Bureau of Ordnance, acting under the direction of the Secretary of the Navy, party of the second part.

Whereas, the proposal of the said party of the first part for the manufacture, test, and delivery of three hundred (300) torpedoes complete in all respects in accordance with drawings,

Designation plans, and specifications approved by the Chief of the of torpedoes. Bureau of Ordinance on October 23, 1905, which torpedoes, for the purposes of this contract, shall be

designated and known as the Bliss-Leavitt, 5-Meter, 21-inch Torpedoes, Mark I, has been accepted by the party of the second part;

Now, therefore, This Contract Witnesseth, that for and in consideration of the premises and of the payments to be made as herein after provided, the party of the first part, for itself and its successors and assigns and its legal representatives, does hereby covenant and agree to and with the party of the second part as follows, that is to say:

Number of 629 First. The party of the first part torpedoes. will, at its own risk and expense, manufacture in conformity with the aforesaid drawings, plans and specifications three hundred (300) torpedoes complete in all parts, appurtenances, and spare parts; such torpedoes to be constructed of material of domestic manufacture and in all respects as described in the annexed specifications, and will deliver the said torpedoes f. o. b., Newport, Rhode Island, it being, however, expressly understood and agreed that if any article or thing included in or covered by the drawings,

plans and specifications aforesaid shall be found Domestic man- during the prosecution of the work under this ufacture. contract to be not produced or manufactured in the United States, and if after reasonable effort it shall be found impracticable to obtain the same articles as articles of domestic manufacture, then and in such case provision shall be made for such alterations in the drawings, plans, and specifications, or for the adoption of such new or different devices or plans as may be found necessary in order to carry out and complete this contract, subject as to increased or diminished compensation by reason of such change to the conditions applicable to changes as expressed in the second clause of this contract.

Second. The manufacture of said torpedoes shall conform in all respects to and with said drawings, plans, and specifications, which are hereto annexed, and which shall be deemed and taken as forming part of this contract with the like operation and effect as if the same were incorporated herein. No omission in the specifications of any detail, object, or provision necessary to carry this contract into full and complete effect shall operate to the disadvantage of the party of

the second part, but the same shall be satisfactorily supplied, performed, and observed by Changes in 630 the party of the first part, and all claims for specifications. extra compensation by reason of or for or on account of such extra performance are hereby, and, in consideration of the premises, expressly waived; and it is hereby further provided, and this contract is upon the express condition, that the specifications aforesaid may be changed, and that such alterations as are not contrary to law

may be made in this contract by the party of the second part, but no such changes shall be made when the cost thereof in the execution of the work exceeds fifty dollars (\$50) on any torpedo, except upon the written order of the Chief of the Bureau of Ordnance, and if changes are thus made the actual cost thereof and the damage, if any, caused thereby shall be ascertained, estimated, and determined by a board of naval officers appointed by the Secretary of the Navy, and the party of the first part shall be bound by determination of said board or a majority thereof as to amount of increased or decreased compensation the said party of the first part shall be entitled to receive, if any, in consequence of such change or changes. The party of the second part reserves the right to alter or rewrite the specifications forming a part of this contract for each lot of fifty (50) torpedoes contracted for therein, after the first such lot, and, if deemed advisable, to change the designation of the mark in each such case; the question of increased or decreased compensation resulting from such change or changes to be adjusted in each case by the board constituted by the provisions of this paragraph; but nothing herein contained shall be construed to limit the power of the party of the second part to make such changes in the specifications at any time as it may see fit under the provisions of the preceding sentences of this clause.

Materials 631 Third. The materials and workmanship used and applied in the manufacture of the workmanship torpedoes herein contracted for in details and finish and inspection. shall be first class and of the very best quality, and shall from beginning to the end of the work be subject to the inspection of the Chief of the Bureau of Ordnance, it being hereby understood, covenanted, and agreed that the said Secretary of the Navy may appoint suitable inspectors to whom the party of the first part shall furnish such samples of said material and such information as to quality thereof and the manner of using the same as may be required, and also any assistance such inspectors may require in determining the quality of steel and other materials either used or intended for use in the manufacture of the torpedoes, and the inspectors may, with the approval of the party of the second part, peremptorily reject any unfit material or forbid the use thereof. The inspectors shall at all times during the progress of the work have full access thereto, and the party of the first part shall furnish them with full facilities for the inspection and superintendence of the same.

Fourth. The party of the first part hereby covenants and agrees to hold and to save the United States and all officers, agents, and representatives thereof, harmless from and against

Patent rights. all and every demand or demands of any nature or kind for or on account of the adoption of any plan, model, design, or suggestion, or for or on account of the use of any patented invention, article, or appliance which has been or may be adopted or used in or about the manufacture or production of said torpedoes by proper releases from

patentees or otherwise and to the satisfaction of the party of the second part.

Specifications 632 Fifth. The steel and other materials to be used in the manufacture of the torpedoes herein contracted for shall conform to the specifications for inspection of material for use in the manufacture of torpedoes, which specifications are annexed to and form part of this contract.

Insurance. Sixth. The torpedoes herein contracted for and all material and appliances provided for and used or to be used in the manufacture thereof shall be kept insured against fire and accident, which insurance shall be renewed and increased from time to time by and at the expense of the party of the first part until the acceptance and delivery of the torpedoes, the loss, if any, to be stated in the policies as payable to the Chief of the Bureau of Ordnance; the insurance to be effected in such manner and in such companies as shall be approved by the party of the second part, and in an amount to be fixed from time to time not exceeding the sum of the payments made under this contract.

Delivery. Seventh: The torpedoes herein contracted for shall be completed in accordance with the specifications annexed hereto and ready for delivery to the party of the second part in lots of five (5), the delivery to be at the rate of at least fifty (50) torpedoes prior to January 1, 1907, and after that date at a rate of at least one hundred and twenty-five (125) torpedoes in each calendar year, but the lien of the party of the second part upon said lots of torpedoes and the materials on hand for use in the manufacture thereof, respectively and collectively, for all moneys paid on account thereof shall commence with the first payment and shall thereupon attach to the work done and materials furnished, and shall in like manner attach from time to time as the work progresses and as further payments are made, and shall continue until it shall have been properly discharged. In case the completion of the torpedoes as aforesaid shall be delayed beyond the period hereinbefore fixed therefor, deductions shall be made from the price stipulated in this contract for each day and every day during continuance of such delay and until the torpedoes shall be completed as aforesaid and ready for delivery to the party

Penalty for of the second part at the rate of eighty-eight dollars delayed delivery (\$88) per day for each lot of five (5) torpedoes with spare parts and tools complete; all such deductions from the price of the torpedoes to be made from time to time from any payment falling due under this contract: Provided, however, That such delay shall not have been caused by the act of the party of the second part, or by fire or water, or by any strike or stand-out of workmen employed in the manufacture of the torpedoes, or by circumstances beyond the control of the party of the first part, but such circumstances shall not be deemed to include delays in obtaining materials, except forgings for air flasks and air-flask heads, when such delay arises from causes other than those herein specified: Provided further, That such penalties shall not be

enforced for delays in the completion of service tests resulting from weather at the testing ground sufficiently bad to prevent the carrying on of such tests, provided and upon condition that all such delays arising from this cause in each calendar month shall be reported by the party of the first part to the party of the second part at the end of each such calendar month, said report to be certified as correct by the inspector of ordnance at the testing ground: And provided further, That in case of any such alleged delay the party of
 634 the first part shall give immediate notice thereof in writing to the party of the second part.

Delays caused by party of the second part. Eighth. All delays that shall be properly attributable to the party of the second part or to its authorized officers or agents and that shall operate upon the completion of the torpedoes within the time specified therefor in this contract shall entitle the party of the first part to a corresponding extension of the period prescribed for the completion of the torpedoes: Provided, however, That no delay nor the alleged causes therefor attributed by the party of the first part to the party of the second part, its officers or agents, shall be considered unless the party of the first part shall at the time of the occurrence of such delay give notice to the Chief of the Bureau of Ordnance in writing of the facts and circumstances in each case and of the extent to which the said party of the first part claims that the completion of the torpedoes is thereby delayed.

Tests. Ninth. The party of the first part hereby further covenants and agrees that when the torpedoes are completed as required by the specifications they shall be subjected to the trials and tests under conditions prescribed by the specifications, and that they shall be accepted only on fulfillment of the requirements therein set forth: Provided, That if at and upon said trials there shall be any failure in the torpedoes to meet fully the requirements of this contract, the party of the first part shall be entitled to make further trials sufficient in number to reasonably demonstrate their capabilities: And provided also, That the number of trials shall be determined and limited by the party of the second part, and that all
 635 expenses of all trials prior to the acceptance of the torpedoes shall be borne by the party of the first part.

Acceptance. Tenth. If at and upon the trials before mentioned the foregoing requirements and conditions shall be fulfilled, then and in such case the torpedoes shall be accepted: Provided, That if, at and upon final trials or at any time within one year after acceptance any weakness or defect in the torpedoes or any failure, breakdown, or deterioration other than that due to fair wear and tear of any part or parts of the torpedoes or their mechanisms shall appear, the same shall be corrected and repaired to the satisfaction of the party of the second part at the expense of the party of the first part.

Rejection. Eleventh. In the case of the rejection of any of the causes provided for in this contract, the party of the first part shall refund to the party of the second part, upon demand, or within sixty days thereafter, all payments theretofore made to

the said party of the first part for or on account of the manufacture of said rejected torpedo or torpedoes.

Failure to proceed with contract. Twelfth. It is further mutually understood, covenanted, and agreed that if at any stage of the work prior to the final completion and delivery of said

torpedoes and appurtenances the Chief of the Bureau of Ordnance shall find that the party of the first part is unable or fails to proceed with and make satisfactory progress in the manufacture and delivery of said torpedoes and appurtenances required, and within the periods prescribed, as aforesaid including such extensions thereof, if any, as may have been granted under the seventh and eighth clauses of this contract, then and in such case it shall be optional with the Chief of the Bureau of Ordnance to declare

636 this contract forfeited on the part of the party of the first part, but such forfeiture shall not affect the right of the United States to recover for defaults that may have occurred under this contract, and, as liquidated damages, a sum of money equal to the penalty of the bond accompanying the same.

Transfer of interest in contract to third party. Thirteenth. It is mutually understood, covenanted and agreed by and between the respective parties hereto that this contract shall not, nor shall any interest herein, be transferred by the party of the first part to any other person or persons.

Government officials not interested. Fourteenth. It is hereby mutually and expressly covenanted and agreed, and this contract is upon the express condition, that no member of or delegate to Congress, officer of the Navy, nor any person holding any office or appointment under the Navy department, is or shall be admitted to any share or part of this contract, or to any benefit to arise therefrom; but this stipulation, so far as it relates to members of or delegates to Congress, is not to be construed to extend to this contract, it being made with an incorporated company.

Convict labor. Fifteenth. The party of the first part hereby further stipulates and agrees that in the performance of this contract there shall not be employed any person or persons undergoing sentences of imprisonment at hard labor which have been imposed by courts of the several States, Territories, or municipalities having criminal jurisdiction.

Bond. Sixteenth. The party of the first part shall give a bond with satisfactory sureties for the faithful performance of the work embraced in this contract in a penal sum equal to ten (10) per cent. of the total cost of the whole number of torpedoes contracted for, as specified in the first clause of this contract, 637 and on July 1 and January 1 of each calendar year the amount of said bond may be reduced to correspond to the contract cost of all torpedoes then undelivered under this contract.

Seventh. The party of the second part, in consideration of the premises does hereby contract, promise, and engage to and with the party of the first part as follows:

Price of torpedoes. 1. The price to be paid for the torpedoes to be manufactured and furnished in accord-

ance with this contract shall be thirty-five thousand five hundred dollars (\$35,500) for each lot of five (5) such torpedoes.

Payments for torpedoes. 2. Payments shall be made in three installments on each lot of five (5) torpedoes as the work progresses as follows: (a) Upon the completion and successful test of the air flasks of a lot of five (5) torpedoes a payment of fifteen thousand dollars (\$15,000) shall be made. (b) Upon the completion and successful shop test and trials of a lot of five (5) torpedoes a payment of twelve thousand dollars (\$12,000) shall be made. (c) Upon final tests and trials and the acceptance of a lot of five (5) torpedoes the final payment of the price in accordance with the provisions of this contract shall be made.

Forms of payment. 3. No payments shall be made except upon bills, in quadruplicate, certified by the inspector in such manner as shall be directed by the Chief of the Bureau of Ordnance, whose final approval of all bills thus certified shall be necessary before payment thereof.

Warrants for payment. 4. All warrants for payments under this contract shall be made payable to the party of the first part or its order.

638 Claims of outside parties. 5. When a payment is to be made under this contract, as a condition precedent thereto, the chief of the Bureau of Ordnance may in his discretion require, for the protection of the party of the second part, evidence satisfactory to him, to be furnished by the party of the first part, that no lien or rights in rem of any kind against said torpedoes, their machinery, fittings, or equipment, or the material on hand for use in the construction thereof, have been or can be acquired for or on account of any work or any machinery, fitting, equipment, or material already incorporated as a part of said torpedoes or on hand for that purpose, or that such liens or rights have either been released absolutely or so subordinated to the rights of the Government as to make its lien for all payments paramount, so as not to encumber or hinder in any way the right of the Government to accept or reject said torpedoes and so as to become absolutely extinguished in case of the acceptance of the torpedoes; but it is hereby further stipulated, covenanted, and agreed, and this contract is upon the express conditions, that no lien shall lie or attach upon or against said torpedoes or the materials therefor, or any part thereof or of either, in favor of any other party, person or persons, firm, association, company, or corporation for or on account of any work done upon or about said torpedoes or materials or of any materials furnished therefor or in connection therewith, nor for or on account of any other cause or thing or of any claim or demand of any kind against the said party of the first part, its successors, assigns, or legal representatives.

Discrepancies. Eighteenth. If any doubts or disputes arise as to the meaning of anything in the drawings, plans, or specifications, or if any discrepancy appear between said drawings, plans, or specifications and this contract, the matter 639 shall be at once referred to the Secretary of the Navy for determination, and the party of the first part hereby binds itself and its successors and assigns and its legal representatives to abide by his decision in the premises.

Nineteenth. It is hereby expressly further stipulated, covenanted, and agreed, that the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations, or others, or for other governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the party of the first part will not exhibit the performance of any torpedo containing such device, either in shop or in service tests, to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; 640 that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract, shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract: Provided furthermore, That no device or design shall be considered as coming within the provisions of this clause unless the party of second part shall state to the party of the first part in writing, at the time when the said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause.

In witness whereof the respective parties hereto have hereunto set their hands and seals the day and year first above written.

[CORPORATE SEAL.] E. W. BLISS COMPANY, [L. S.]
By JAS. W. LANE, *Pres't.* [L. S.]
N. E. MASON, [L. S.]
Chief of Bureau of Ordnance.

Signed and sealed in the presence of—
— — —

Attest:

H. C. SEAMAN, *Secretary.*

As to E. S. Brandt, Chief of Bureau of Ordnance.

641 COMPLAINANT'S EXHIBIT 2.

*Contract for the Manufacture of One Hundred and Twenty (120)
Torpedoes for the U. S.*

Bliss-Leavitt, 5.2 Meter by 45-Centimeter, Mark VII.

Contract, of two parts, made and concluded this 12th day of June, 1912, by and between the E. W. Bliss Company, a corporation created under the laws of the State of West Virginia, and doing business in the city of Brooklyn, State of New York, represented by F. C. B. Page, the Vice-President of said company, party of the first part, and the United States, party of the second part.

Whereas, a proposal of the said party of the first part for the manufacture, test, and delivery of one hundred and twenty (120) torpedoes, complete in all respects, in accordance with drawings, plans, and specifications approved by the Chief of the Bureau of Ordnance, which torpedoes, for the purposes of this contract, shall be designated and known as the Bliss-Leavitt, 5.2 meter by 45-centimeter torpedoes, Mark VII, with single regulars (see letter 7/24/13) has been accepted by the party of the second part:

Now, therefore, this Contract Witnesseth, that for and in consideration of the premises and of the payments to be made as hereinafter provided, the party of the first part hereby covenants and agrees to and with the party of the second part as follows, that is to say:

642 First. The party of the first part will, at its own risk and expense, manufacture, in conformity with the aforesaid drawings, plans, and specifications:

- (a) 120 torpedoes, complete, with gyro and operating tools, exercise head and war head, together with one set ready tools for each two (2) torpedoes, at \$5,800 each \$696,000
- (b) 120 sets of gyro spare parts, complete at \$40 each. . . . 4,800

(c) 24 sets of supply box tools, including one set of taps and dies for all special screws, bolts, nuts, etc. Each set of supply box tools and each set of taps and dies to be furnished with a stowage box, at \$250 each	6,000
(d) 24 sets of spare parts and washers in stowage box, at \$123 each	2,952
(e) 10 sets gyros, complete, including gyro frames and attached mechanisms, with box, spare parts, and operating tools at \$890.....	8,900
(f) 20 sets gyro pots (inner and outer gimbal rings, wheels, and holder), at \$350 each.....	7,000
(g) 20 gyro adjusting stands, at \$250 each.....	5,000
Total.....	\$730,652

One set each of Items (c) and (d) to accompany each lot of five torpedoes; the remainder required to complete the full number of sets contracted for shall be delivered with the last lot of torpedoes.

One set of gyros, complete, with box spare parts, and operating tools, Item (e), to accompany each ten torpedoes delivered.

One set of gyro pots (inner and outer gimbal rings, wheels and holder), to accompany each of the first twenty (20) lots of torpedoes delivered.

One gyro adjusting stand Item (g), to accompany each of the first twenty (20) lots of torpedoes delivered.

Such torpedoes and accompanying appurtenances and spare parts to be constructed of material of domestic manufacture, and to be in all respects as described in the specifications; and will deliver the said torpedoes f. o. b., Newport, R. I., it being, however, expressly understood and agreed that if any article or thing included in or covered by the drawings, plans, and specifications aforesaid shall be found during the prosecution of the work under this contract to be not produced or manufactured in the United States, and if after reasonable effort it shall be found impracticable to obtain the same as an article of domestic manufacture, then and in such case provision shall be made, by or with the approval of the Secretary of the Navy, for such alterations in the drawings, plans, and specifications, or for the adoption of such new or different device or plan as may be found necessary in order to carry out and complete this contract, subject as to increased or diminished compensation by reason of such change to the conditions applicable to changes as expressed in the second clause of this contract.

Second. The manufacture of said torpedoes (the word "torpedoes" as used throughout this contract being intended to include everything covered by the drawing, plans, and specifications above referred to) shall conform in all respects to and with said drawings, plans and specifications, including duly authorized changes therein, but said drawings, plans and specifications are not hereto annexed

or made a part hereof. They contain information of a confidential character that can not be made public without detriment to the Government's and the contractors' interests, and they are to be treated as confidential by the parties to this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and
 644 sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract.

No omission in the drawings, plans, or specifications of any detail, object, or provision necessary to carry this contract into full and complete effect shall operate to the disadvantage of the party of the second part, but the same shall be satisfactorily supplied, performed, and observed by the party of the first part, and all claims for extra compensation by reason of or for or on account of such extra performance are hereby, and, in consideration of the premises, expressly waived; and it is further provided that the provisions of this contract, and the drawings and specifications aforesaid, may be changed by the party of the second part. The cost of such changes shall be estimated by the naval inspector at the works of the party of the first part, and if less than five hundred dollars (\$500) shall be determined by him, subject to approval by the Chief of the Bureau of Ordnance. If the cost of such changes as estimated by said inspector be five hundred dollars (\$500) or more, the cost thereof shall be determined by a board of not fewer than three naval officers, whose determination shall be subject to approval by the Secretary of the Navy. The determination of said inspector or of said board as to the amount of the increased or diminished compensation that the party of the first part shall be entitled to receive, if any, in consequence of such changes shall, when approved by the Chief of the Bureau of Ordnance or by the Secretary of the Navy as herein provided, be binding upon the party of the first part: Provided, That no such change shall be made when cost thereof shall, in the execution of the work, exceed five hundred dollars (\$500), except upon the written order of the Secretary or the Assistant Secretary of the Navy.

* * * * *

645 (Mem. by Counsel: The portions of this contract here omitted are agreed for the purposes of this case to be not materially different from the corresponding portions of Exhibit 1, 1905 contract.)

Twentieth. It is hereby further stipulated, covenanted, and agreed that the party of the first part will not make use of any device, the design for which is furnished to it by the party of the second part, in any torpedo constructed or to be constructed for any person or persons, firms, corporations, or others, or for other governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to or give information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second party hereto; that the party

of the first part will not exhibit the performance of any torpedo containing such device, either in shop or service tests, to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that in case of breach of these provisions on the part of the party of the part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, 646 patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract, shall become the property of the party of the second part, and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of moneys or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract: Provided, furthermore, That no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when the said device is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause.

Authority reserved by the specifications aforesaid to the Bureau of Ordnance or any officer thereof shall be understood to be reserved to the party of the second part.

Twenty-first. This contract having been awarded conformably to restrictive provisions in the Naval Appropriation Act of March 4, 1911, upon the express understanding that the party of the first part has not entered into any combination, agreement, conspiracy, or understanding, the effect, object, or purpose of which is to deprive the Government of fair, open, and unrestricted competition in letting 647 contracts for the furnishing of armor or armament, and has not combined or conspired to monopolize the interstate or foreign commerce or trade of the United States or the commerce or trade between the United States and any Territory or the District of Columbia in structural steel, ship plates, armor, armament, or machinery, and the Vice-president of said company having furnished the Secretary of the Navy with an affidavit to this effect, it is hereby further covenanted and agreed, and this contract is upon the express condition, that in case it be ascertained at any time after the signing hereof that false representations were made in said affidavit with respect to the requirements referred to above

of said statutes, this contract may be annulled in whole or in part by the Secretary of the Navy at his discretion.

In Witness Whereof the respective parties hereto have hereunto set their hands and seals the day and year first above written.

Signed and sealed in the presence of—

[Seal of E. W. Bliss Company.]

E. W. BLISS COMPANY. [L. S.]

F. C. B. PAGE, [L. S.]

Vice-President.

H. C. SEAMAN, *Secretary.* [L. S.]

F. W. C., *Acting.*

THE UNITED STATES, [L. S.]

By PHILIP ANDREWS, [L. S.]

As Acting Secretary of the Navy.

[Seal of Navy Department.]

HENRY W. MILLER, *Solicitor,*

As to PHILIP ANDREWS,

Acting Secretary of the Navy.

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COMPLAINANT'S EXHIBIT 2 (A).

Specifications for the Manufacture of Bliss-Leavitt Automobile Torpedoes, U. S. Navy 5.2 Meters by 45 Centimeters. Mark VII.

Drawings and Specifications.

1. Description of drawings.—The torpedoes under this contract shall be manufactured in all respects in accordance with the approved drawings furnished by the Bureau of Ordnance. These drawings will be submitted before the manufacture of the torpedoes under these specifications is begun.

Inspection.

2. Inspectors.—The Bureau of Ordnance shall have the right to keep agents or inspectors at the works where the material is produced, where the manufacture is carried on, and where the tests are made, which inspectors shall have free access to all parts thereof and shall be permitted to examine freely the raw material, to witness all the process of manufacture, all private tests, whether of material or mechanism, conducted by the contractors, and to examine all the contractors' records with reference to such matters.

3. Daily statement.—A written list of materials or mechanisms ready for inspection and tests to be commenced or in progress shall be furnished to the chief inspector.

4. Information required by inspectors.—All information and reports, written or verbal, concerning material, tests, processes, etc., and all assistance that the inspectors may require from the con-

tractor or his employees, shall be rendered free of charge to the Bureau of Ordnance.

5. Office for inspectors.—The inspectors shall be supplied
649 free with suitable office room at the various works and with such plain office furniture as may be necessary to the proper transaction of their business as agents of the Bureau of Ordnance.

6. Discovery of faulty work or material.—If the chief inspector present considers that any of the work is not in accordance with the contract he will so inform the contractor at once, and immediately thereafter give his reasons for doing so in writing, both to the Bureau of Ordnance and to the contractor. Any work done by the contractor on the material in question after the verbal notification shall be at his own risk.

7. Expense of tests and instruments used.—Except as hereinafter provided, all tests, measurements, etc., shall be made at the expense of the contractor, under the observation and supervision of the bureau's inspectors, and with the contractors' gauges and instruments. The inspector has the right to verify all testing or gauging instruments at any time during which they may be in use by him for inspections of work or material.

8. Time of inspection.—Inspections will be made at any time or times that the inspector shall see fit, and without notice being given, but the inspectors must use discretion and not interfere unnecessarily with the progress or control of work.

Parts which have been previously inspected in detail and passed by the inspector and have been assembled by the contractor, shall not be subjected to further detailed inspection requiring disassembly of the mechanism to which they belong, except when such disassembly is done by the Government force and at the Government's
650 expense, but may be so inspected at any time that said mechanism may be disassembled by the contractor for other cause.

The above restrictions shall in no way apply to the detailed inspections of the torpedo and its parts by the Government inspectors after its acceptance runs at Sag Harbor and before its final shipment to the naval torpedo station to complete delivery.

Nor shall these restrictions apply to any assembled mechanism which may give evidence of defects in manufacture or deficiency in performance.

After the return of the torpedoes from service trials at Sag Harbor, they shall be disassembled at the factory, all parts cleaned, and such damaged or defective parts as the inspector may deem necessary replaced. They shall then be reassembled in first-class condition, ready in all respects for issue to the service. Notice of the time of such disassembly shall be furnished to the inspector, and an opportunity afforded for general inspection of parts. All parts to be open to inspection at all times between disassembly and reassembly.

9. Contractor to inspect work first.—All machined work must be examined by the agents of the contractors for workmanship and material, and found to be up to the contract standard, before it is submitted to the inspector.

10. Inspection of machine work.—The contractor has the right to submit machined work to the inspector at such times and in such lots as shall be most convenient to him. If, however, the inspector considers that the work ready for inspection is allowed by the contractor to accumulate in inconvenient quantities before being presented for inspection, he shall have the right to require said work to be presented for inspection in such lots and at such times as he may find convenient.

651 11. Bureau may use its own instruments.—Lots of machined work shall be submitted with the gauges and instruments used in the contractor's inspection, and, if these are not satisfactory, the Bureau of Ordnance may provide (at its own expense) and use any other gauges and instruments that it may see fit.

12. Condemned material.—Material or work condemned by the inspector shall not be embodied in the articles to be furnished the Bureau of Ordnance, and when in the opinion of the inspector such action is necessary condemned material shall be properly marked by him for identification as condemned or rejected material.

The inspector is to decide, in the first instance, as to results of all official tests, but if he is in doubt he may refer the matter to the Chief of the Bureau of Ordnance.

The obligation is upon the contractor to satisfy the inspector as to the correctness of everything and its accordance with the terms of the contract.

13. Contractor to assist inspectors.—The contractor at all times shall render such assistance to the inspectors as the latter may require in the prosecution of their duties as they understand them.

14. Inspection marks.—All component parts of the torpedo will be marked with a number which will identify that part with the torpedo in which it is assembled and tested for acceptance, and in conformity with the following list, i. e.—

1. Valve group.
2. Superheater pot.
3. Nozzle valve.
4. Spray and holder.
5. Turbine wheels.
- 652 6. Turbine gear case, top cover, and bottom plate.
7. Frame for thrust bearing.
8. The bearing in afterbody bulkhead.
9. Tail bearing.
10. Forward and after propeller shafts.
11. Forward and after propeller sleeves.
12. Propeller, cones and nuts.
13. Depth engines.
14. Distance gear.
15. Flask.
16. Afterbody.
17. Heads, to have serial numbers only, beginning with unity.
18. Tail.
19. Gyro pot.

All parts of the torpedo as enumerated above shall, after their successful completion of the dynamometer test and previous to all other shop tests, be marked with the torpedo number for which they are intended and with whose parts they are to be inspected. The Bureau of Ordnance register numbers of the torpedoes covered by these specifications will be as assigned by the Bureau of Ordnance.

15. Description of torpedoes.—The torpedoes to be furnished under the contract of which these specifications form a part shall be the Bliss-Leavitt automobile torpedoes, Mark VII, of five and two tenths (5.2) meters length over all, including not less than two and one-half ($2\frac{1}{2}$) inches for war nose and forty-five (45) centimeters diameter, with separate war (except exploder) and exercise heads complete for each torpedo, and shall be fitted for discharge either from submerged tubes or by removing the necessary guides for above-water discharge. They shall be manufactured in strict conformity with the submitted drawings, these specifications, and the contract.

16. Speed and range.—Each torpedo shall be required to make a speed of at least thirty-two (32) knots for a range of four thousand (4,000) yards, and shall fulfill all the conditions required by these specifications under service trials.

17. Buoyancy, stability and trim.—The torpedo shall be of such design that the centers of gravity of the air charge, of the air flask, and of the entire torpedo and the center of buoyancy of the entire torpedo, for both war and exercise conditions, shall be within one (1) inch of the same transverse plane, which plane shall pass through the guide studs used for lifting the torpedo. The buoyancy, stability and trim of the torpedo shall be the same when ready for either a war or for an exercise shot. The trim shall be the same with the air flask fully charged that it is with the air flask empty. The buoyancy of the torpedo when ready for an exercise or a war shot from a submerged tube shall be at least one (1) pound in excess of that necessary to float the torpedo when charged to one thousand three hundred (1,300) pounds per square inch air pressure, in water of a specific gravity of 1.026 at 62 degrees F., the temperature of the torpedo and its air charge to be the same as that of the water during the test. The alcohol and water compartments shall be half full during this test.

18. War heads.—The war heads shall be of phosphor bronze. The war and exercise heads and fittings must be absolutely interchangeable, and the center of gravity of torpedo under both war and exercise conditions must be in the same position. The war head must be capable of holding at least two hundred (200) pounds of wet gun cotton with twenty-five (25) per cent. of moisture. The war head is to be fitted to use the United States Navy exploder and dry gun-cotton primers. The standard Navy exploder to be furnished by the United States Government. The war heads to be absolutely interchangeable with any torpedo of the Mark VI or Mark VII type for fit, and to be of uniform weight, metacentric height, and center of gravity within the limits specified. The war and exercise heads shall have the same external

shape and dimensions. War heads to successfully withstand a test pressure (external) of seventy-five (75) pounds to the square inch without deformation or damage.

Each war head to be supplied in a packing case made to approved drawings.

19. Exercise heads.—The exercise heads shall be in accordance with the approved drawings filed in the Bureau of Ordnance, and must be absolutely interchangeable with any war head of any torpedo of the Mark VI or Mark VII type. Exercise heads to successfully withstand a test pressure (external) of seventy-five (75) pounds to the square inch without deformation or damage.

20. Air flask.—The air flask shall be forty-five (45) centimeters outside diameter; the forward head, the after head, and the water chamber head to be removable. The flask and heads shall be of mild ductile steel forged or hot drawn, and shall be of not less than ninety thousand (90,000) pounds per square inch elastic limit, with an elongation of not less than fifteen (15) per cent. in length of two (2) inches. The greatest variation allowed among all the test pieces cut from the same flask, or flask head, shall be, in elastic limit, twenty-thousand (20,000) pounds per square inch, and in elongation five (5) per cent. The flask shall be constructed

655 for twenty-two hundred and fifty (2,250) pounds per square inch air pressure, and must stand a test of three thousand (3,000) pounds per square inch oil pressure. The surfaces of the flask both inside and out shall be given a smooth finish and polish, and shall be protected from rust by the application of such coating as the Bureau of Ordnance may direct.

Whatever may be the process of manufacture of the flasks and flask heads, no heat shall be applied to any part thereof after the forgings are finished except under the following conditions:

Provision will be made to insure that in any heating subsequent to final annealing of the forgings nothing shall be done which will reduce the good qualities obtained by such final annealing by setting up internal stresses, etc., and every possible effort shall be made to accomplish this object.

21. Turbines.—The engine shall be a turbine engine designed for and capable of giving the torpedo a speed of at least thirty-two (32) knots an hour without damage to any part, and of standing without damage tests of twenty-five (25) per cent. overload and of twenty-five (25) per cent. excess of speed, for a period of not less than thirty (30) seconds.

22. Drain plug in flask.—There shall be a drain plug in the air flask to enable liquid to be drawn off.

23. Gyro gear.—Each torpedo must be fitted with a horizontal direction regulating device or gyro gear to efficiently direct the course of the torpedo. In the shell of the torpedo, visible from the outside, there shall be installed a gyro index which will indicate in degrees the setting of the gyro from zero (0) degrees to one hundred (100) degrees on either side.

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24. Fitted for submerged discharge.—The torpedo shall be fitted for submerged discharge, and shall also be capable

of being run from the standard above-water tube by removing the guides.

25. Starting gear.—The starting gear of the torpedo, while ordinarily operated by the motion of the torpedo in the tube, shall be so fitted that it is practicable to start the torpedo by hand from outside while the torpedo is lying in the water alongside a boat.

26. Length and diameter.—Each torpedo shall be five and two-tenths (5.2) meters in length over all from the end of the nose to the end of the tail; the greatest diameter shall be forty-five (45) centimeters.

27. Speed regulator.—Each torpedo shall be fitted with a speed regulating device or valve accurately regulating the speed and for insuring the attainment of the contract requirements as to speed and range as hereinafter provided for.

28. Depth regulator.—Each torpedo shall be fitted with a depth regulating device to efficiently govern the depth of the torpedo when running at depths up to twenty-five (25) feet, the index of which must be marked in feet from zero up to twenty-five (25) feet.

29. Cut-off.—Each torpedo shall be fitted with an efficient cut-off to prevent the turbines from running away and wrecking the torpedo in case the torpedo jams in the launching tube or broaches during a run.

30. Torpedo torch.—Each torpedo shall have a pocket fitted in the exercise head, and also, if practicable, in the afterbody, to carry a torpedo torch for locating the torpedo when fired for exercise.

31. Exploder.—Each torpedo shall be fitted to receive the
657 United States Navy standard torpedo exploder and dry gun cotton primer.

32. Sizes and types of tools, etc.—The number of different sizes and types of tools, screws, nuts, bolts and similar material must be reduced to a minimum by making each of them useful for the greatest possible number of purposes.

The tools are to be made of the material specified in detailed list; they will be tested by the inspector by selecting one set out of every six and using them for taking a torpedo apart, or in any other manner he may see fit. They are to be strictly in accordance with the drawings and supplied in boxes conforming to pattern.

33. Preliminary drawings.—Manufacture to be to drawings already supplied and approved.

34. Tools, etc., to be furnished.—The torpedoes, when delivered, shall be complete in all details, ready for service, except the explosive charge and exploder, and in addition, there shall be furnished the spare parts, tools and accessories as set forth in clause first of the contract.

The specifications which govern the supply of material used in the torpedo will apply also to the spare gear and outfit stores, and when testing the interchangeability of details the spare gear and outfit stores should also be tested.

35. List of tools, etc.—A list of tools and spare parts must be sub-

mitted for approval with drawings referred to in paragraph 1 of these specifications.

36. Cost of detailed parts.—The contractor will, prior to the second payment on the first lot of torpedoes manufactured, submit, for the approval of the Bureau of Ordnance, a list containing each piece in the torpedo, with an appraised price attached. The
658 total of these appraised prices shall not exceed the total price of the torpedo or of the tools and appurtenances as given in clause first of the contract to which these specifications are attached. This list of appraised costs to be for the guidance of the Government in obtaining (in lots of twenty-five (25) or more) such additional pieces or parts, tools, or appurtenances as may be decided upon as necessary for future stock to replace broken or worn parts in torpedoes of the type manufactured under the contract to which these specifications are attached.

Materials for Steel Forgings for Torpedo Air Flasks and Flask Heads.

37. Drawings.—The shape of each forging required, rough bored and turned, will be shown on proper prints.

38. Chemical analysis.—All raw materials shall be chemically analyzed in the most approved manner by the contractor before use, and the proper records thereof and proper melting records shall be kept by him.

39. Character of forging.—Forgings shall be made of open-hearth steel of domestic manufacture from the best quality of raw material, uniform in quality throughout the mass of each forging and throughout all forgings of the same dimensions, and free from slag, seams, cracks, cavities, flaws, blowholes, unsoundness, foreign substances, and all other defects affecting their resistance and value.

40. Casting of ingots.—Ingots shall be cast solid and shall have an excess of weight of forty (40) per cent. above that of the rough unbored forging with specimen ends on. On this excess at least thirty (30) per cent. of the weight of the ingot shall be discarded from the upper end and five (5) per cent. from the lower end.

41. Ingots not cast.—In case any other method is pro-
659 posed for producing the solid ingot, its acceptance shall be conditional upon the rule that the part of each which is to be delivered for test and acceptance must be equal in quality and in all other respects to an ingot cast solid in the usual way, from which at least thirty (30) per cent. of the weight of the ingot has been discarded from the upper end and five (5) per cent. from the lower end.

42. Weight of ingot.—The weight of the original ingot shall remain as above, whatever method of forging is employed.

43. Imperfections.—Ingots must be free from imperfections that would injuriously affect the finished forging.

44. Bored ingots.—In case cylinders are forged from bored in-

gots, the walls of the ingots at all points must be reduced in thickness by forging, at least forty (40) per cent.

45. Solid ingots.—In case cylinders are forged from solid ingots by upsetting and punching and subsequent elongation or enlarging on a mandrel, the walls at all points must be reduced in thickness, by forging on a mandrel, at least thirty-three (33) per cent.

46. Ingots to be cylindrical.—Ingots must be forged as plain, hollow cylinders, and to within two (2) inches or less of the finished diameters, inside and out.

47. Length of forgings. The contractor must leave forgings long enough to get test specimens beyond the finished dimensions. The hollow cylinders are to be rough turned and bored.

48. Tempering and annealing.—Forgings shall be all oil-tempered under such conditions as will secure their resistance, and annealed. No piece shall be accepted, nor will its test specimens be broken or considered, unless the last process has been an annealing one. The forging must be left with a uniformly fine grain.

49. Insufficient forging.—If the inspector finds that any part of the forging has received less hammering or other beneficial treatment than it should properly have received, as compared with the parts from which test bars are to be taken, the piece will be rejected.

50. Temper.—After the final forging the heating must be uniform or uniformly graded throughout the entire piece; and all heating for tempering and all immersion shall be executed with the forging in a vertical position. The whole of the piece must be subjected to the treatment at the same time.

51. Report of process.—The contractor shall state for each piece, in writing, the exact treatment it has received.

52. Inspection of fractures.—The inspector will examine all fractures of the metal in the course of manufacture for the purpose of determining whether it is of uniform and homogeneous structure.

53. Drawn flasks.—If the flask be of drawn steel, the process to be employed in its production must be approved by the Bureau of Ordnance before the work is begun and must be such as will produce a flask equal or superior to that called for by the preceding paragraphs, the tests to determine such equality or superiority to be such as may be directed by the Chief of the Bureau of Ordnance.

661 *Tests and Acceptance of Forgings for Torpedo Air Flasks and Flask Heads.*

54. Inspection of forgings.—Forgings presented for provisional tests and acceptance will be critically inspected for defects of soundness and workman-ship as aforementioned. The records and facts as to their composition and treatment and all other matters affecting them will be considered, and they will be subjected to physical tests. They must conform to the requirements in all particulars and must

meet all inquiry and test successfully in order to be provisionally accepted.

55. Physical tests.—Physical tests will be directed toward the exhibition of all the principal physical qualities of the metal. Those to which particular attention will be devoted are elasticity and extensibility.

56. Presentation of specimens.—Specimens shall be presented to the inspector in sets, each set comprising all those belonging to one forging. He is to test and decide upon these within four days after presentation.

57. Character of specimens.—These tests will be made on cylindrical specimens two (2) inches long between measuring points, one-half ($\frac{1}{2}$) an inch in diameter, and of the general shape of the standard Navy specimen. The specimens shall be taken from the forgings after final treatment transversely to the longitudinal axis of the forging and within the finished section prolonged. They shall be taken as near the finished piece as practicable, leaving sufficient metal for submitting additional test bars in case of re-treatment.

58. Test to be supervised by inspector.—Test bars shall be cut and tests made under the supervision of an agent or inspector of the Bureau of Ordnance, who may make the tests personally if he so desire. He will stamp and have custody of each test bar.

59. Place of test.—If the contractor provides a testing machine of a pattern approved by the Bureau of Ordnance, the tests may be made at his works, otherwise the test bars shall be suitably packed and delivered by the contractor, f. o. b. cars, for transportation to such place as the Bureau of Ordnance may direct. The expense of testing in this latter case will be borne by the Bureau of Ordnance. The contractor has the right to be present at tests outside his works. Under any circumstances the Bureau of Ordnance may, if it so elects, have the tests made at any place.

60. Physical qualities of metal.—The following table indicates the limit of physical qualities that must be shown by tensile specimens, upon which the forgings will be provisionally accepted or rejected:

Elastic limit.....	Not less than 90,000 pounds per square inch.
Elongation.....	Not less than fifteen (15) per cent. in a length of 2 inches.

61. Limits of variation in tests.—The limit of variation permitted among all the test pieces cut from any one forging shall be as follows:

In elastic limit.....	20,000 pounds per square inch.
In elongation.....	5 per cent.

62. Number of specimens.—The contractor shall first present two specimens from each end of each cylinder and each flask head.

63. Specimens not to be treated.—After a piece is cut or otherwise detached from a forging, no specimen from the piece will be considered if the latter has received any treatment after being detached as aforesaid.

64. Re-treatment of forging.—In case the results obtained from the first submission do not conform to the specifications, and in case the contractor is of opinion that the quality of the metal will be improved by re-treatment, he may re-treat the forging and submit additional specimens, and the results obtained from the former will no longer be considered, except with reference to the presence of slag, sand, and other foreign substances.

65. Slag, etc.—If one or more specimens taken from a test slice from any forging show slag, sand, or other foreign substance, visible to the naked eye, the Bureau of Ordnance may reject the forging without considering the physical results obtained from the specimens; but if the piece is of sufficient length to allow the contractor to cut an additional slice from the same end, a complete set of specimens (two) will be submitted from this slice, and if one (1) of these specimens shows slag, etc., as above, the Bureau of Ordnance may reject the forging without considering the physical results obtained from the specimens; but if the piece is of sufficient length to allow the contractor to cut a third slice, a complete set of specimens (two) will be submitted from this slice and if any of these specimens show sand, etc., as above, the Bureau of Ordnance may reject the piece.

66. Slag, etc.—The fracture of every specimen falling below the requirements shall be examined with a magnifying glass for the presence of slag, sand, or other foreign substance, and the presence of any foreign substance in two specimens from the same end
664 of any forging shall cause its rejection.

67. In these cases the results of previous tests will only be considered so far as slag, etc., are concerned.

68. Anneal after re-treatment.—In all cases of re-treatment, the last process must also be an annealing one.

69. Additional specimens.—If the Bureau of Ordnance should wish to have specimens taken for its own purposes, and independent of the official tests, it will so inform the contractor in writing, and will pay for the bars at a rate agreed upon.

70. Private tests.—Tests of any kind that are to be made by the contractor on his own account must be reported to the chief inspector beforehand, in order that the Government inspectors may have opportunity to witness them.

71. Board on doubtful material.—If, during the manufacture of a cylinder or subsequently thereto, but before proof, defects have been discovered which have led to the rejection of a forging, but which in the opinion of the contractor are of so slight a character as to give rise to reasonable doubt whether the strength and resistance of the forging for use is thereby lessened in any material way, he may make a written statement to the Bureau of Ordnance to that effect, and that bureau will thereupon cause the question to be referred to a board of naval officers, which shall report the facts and a majority opinion for the bureau's consideration previous to final action. If any of the specimens from a piece have fallen below the requirements, the board shall always give special consideration to that fact. When practicable, one member of the board shall be from the office in which the rejection was made.

665 72. Failure of finished flask.—If during pressure proof, after the completion of an air flask, it shall fail on account of imperfect metal, the presence of flaws, slag, cavities, or foreign substances in number or quantity serious enough to be clearly the sole cause of such failure, the forging shall be replaced by the contractor.

73. Reports of tests.—The contractor shall give the inspector two (2) copies of the results of tests, in such form as may be approved by the Bureau of Ordnance, immediately after the tests are made; and the four days' interval allowed the inspection for decision will not commence until these copies are furnished.

74. Patents, etc.—If any objects, operations, machines, or methods employed by the contractor for this manufacture, production, etc., are protected by caveats, patents, or otherwise, the contractor is to save the department and all its officers or agents harmless against all claims of patentees or others with regard to such matters.

75. Dimensions of rough-bored pieces.—All pieces rough bored and turned must be within the dimensions allowed, and they will be measured and calipered at the expense of the contractor, to satisfy the inspector that the dimensions have not been exceeded.

76. Chief of bureau to decide in case of doubt.—Except as herein otherwise provided, the behavior of the specimens under test, the place at which tests shall be made, the position at which test bars shall be taken, the nature and number of tests, and the results of all shall be determined by the Chief of the Bureau of Ordnance, whose decisions on all questions in relation to such matters shall be final.

666 77. Waiving of tests.—The Bureau of Ordnance reserves the right to waive any of the foregoing tests.

78. Drawn flasks.—Should the flasks or flask heads be produced by any other method than forging, they shall meet such tests as may be prescribed by the Chief of the Bureau of Ordnance, in order to determine that the results obtained are equal or superior to those called for by the preceding paragraphs.

79. Material of after body.—The shell of after body shall be of steel, and provision shall be made, by phosphorbronze bouchings or otherwise, to prevent oxidization taking place between inaccessible parts.

80. The flanges of the connections of after body shall be of non-corrosive metal, or the surfaces be so treated as to be practically non-corrosive. The tail and flanges should be drawn together in such manner as to insure rigid connections. The tail to be made of steel.

81. Material first class—

(a) The materials used in the manufacture of torpedoes under these specifications shall be first class as to quality and fittings. No parts of these torpedoes shall be manufactured of aluminum or aluminum composition.

(b) Specifications for materials to be incorporated in torpedoes; unless otherwise specified, test specimens are to be 2 inches long between measuring points and 0.200 square inch cross section.

Steel for turbine rotors:

Ultimate strength.....	pounds	90,000
Elastic limit.....	do.	65,000
Elongation	per cent	20

Steel for engine shafts:

Ultimate strength.....	pounds	125,000
Elastic limit.....	do.	95,000
Elongation	per cent	15

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Steel for engine gears:

Ultimate strength.....	pounds	130,000
Elastic limit.....	do.	90,000
Elongation	per cent	15

Steel for heater pots:

Ultimate strength.....	pounds	100,000
Elastic limit.....	do.	70,000
Elongation	per cent	15

Tool steel:

Ultimate strength.....	pounds	75,000
Elastic limit.....	do.	40,000
Elongation	per cent	25

Machinery steel:

Ultimate strength.....	pounds	50,000
Elastic limit.....	do.	30,000
Elongation	per cent	25

Sheet steel for afterbodies and heads:

Test pieces to be 1 inch wide cut lengthwise and crosswise of grain and 4 inches between measuring points—

Ultimate strength.....	pounds	56,000
Elongation	per cent	15

Monel metal:

Ultimate strength.....	pounds	90,000
Elastic limit.....	do.	55,000
Elongation	per cent	25

Tobin bronze:

Ultimate strength.....	pounds	60,000
Elastic limit.....	do.	30,000
Elongation	per cent	30

Manganese bronze:

Ingots for forge or foundry use—

Ultimate strength.....	pounds	60,000
Elastic limit.....	do.	30,000
Elongation	per cent	15

Sheet phosphor bronze:

Test piece to be 1 inch wide, cut lengthwise and crosswise of grain, and 4 inches between measuring points—

Ultimate strength.....	pounds	50,000
Elongation	per cent	14

Copper tubing:

To stand hydrostatic pressure of 3,000 pounds

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per square inch when subjected to air pressure.

Sheet brass:

Test pieces to be 1 inch wide, cut lengthwise and crosswise of grain, and 4 inches between measuring points—

Ultimate strength.....	pounds	45,000
Elongation	per cent	12

Rubber:

Rubber gaskets to be of pure rubber not less than 35 per cent. Total sulphur not less than 4 nor more than 6 per cent.

Rubber substitutes and extractive matter not more than 5 per cent. Remainder to be mineral matter, which must consist of either oxide of zinc, or litharge, or both, and whiting. Adulterations with sulphate of baryta or sulphate of lead will not be permitted. In case any other material than that enumerated above is used in this contract, the specifications shall be submitted to and approved by the Bureau of Ordnance previous to manufacture.

(c) The contractor may vary the proportion of the constituents, provided that no other ingredients are introduced than those specified, and that the conditions with regard to tensile strength, elongation and freedom from defects are fulfilled, and provided a request is submitted to and approved by the Bureau of Ordnance.

(d) Castings: All castings to be thoroughly satisfactory and free from defects.

(e) Forgings: To be perfectly free from seams, flaws, and defects of every description.

(f) No brazing, electric welding, or other treatment of defective castings will be allowed until the defective material has been submitted to the Government inspectors and such treatment authorized by them.

(g) In special cases where any of the material fails to satisfy the exact terms of the specifications but shows by general appearances that the material is good and suitable for torpedo manufacture, the inspector may use his discretion in recommending its acceptance by the Bureau of Ordnance.

(h) All parts of the torpedo, including connections, that are subject to air pressure are to be tested to a pressure of three thousand

(3,000) pounds per square inch. Water compartments to be tested to a pressure of eight hundred (800) pounds per square inch. Adequate means of relieving this compartment of pressure in case of leaky flask heads is essential to safety, and will be provided for.

82. Interior protection.—The internal surface of immersion chamber, engine room, afterbody, and tail shall be thoroughly protected from corrosion by such method as may be approved by the Bureau of Ordnance.

83. Protection against corrosion.—Where practicable, non-corrosive metals or those not affected by sea water shall be used, especially for bearing surfaces of the moving parts of the mechanism. Internal surfaces affected by the action of moisture shall be protected by efficient means, and shall also be readily accessible for inspection and cleaning in order to prevent deterioration.

Each gyro shall be supplied with a moisture-proof stowage box, which box shall contain the spare parts and operating tools.

84. Ballast.—Where ballast is used, means must be provided to prevent corrosion of the shell of torpedo underneath this ballast.

670 85. Parts interchangeable.—All parts to be made to gauge, and to be strictly in accordance with approved drawings within the limits of the tolerances shown thereon, and, in addition, the following-named parts shall be absolutely interchangeable:

War heads as units, flasks, exercise heads, as units, afterbodies, as units, tails, as units, engines, as units, engine parts—Rotor, ball bearings, bearing sleeve for inner turbine spindle, turbine spindles, and spur gears, superheaters, with nozzle, as units, pistols, sprays, spray holders, valve groups, as units, depth gear, distance gear, gyro gear, as a unit. Gyro gear parts—Gimbal housings, gyro wheels, gyro centers. Gimbal bearings, gyro closure doors. Afterbody handhole covers, starting mechanisms, as a unit, propeller shafts, propellers, as to hub sizes, propeller cones, propeller-follower nuts, except as to position of lock screw, afterbearing sleeve for main engine shafts. All bolts, nuts, and screws, spare propellers will be made to standard gauge.

Shop Tests of Torpedoes.

86. Drawings.—Blue prints identical in all respects to approved tracings previously supplied shall be furnished the chief inspector as required.

87. Shop tests.—Each torpedo shall be subjected to the following tests:

(a) Oil pressure. Each air flask shall stand a statical pressure of three thousand (3,000) pounds per square inch with linseed oil, without permanent set or elongation.

(b) Tightness of air fittings: Each torpedo shall be charged to twenty-two hundred and fifty (2,250) pounds air pressure per square inch, and shall show no leaks through the heads of the air flask. It shall be weighed while so charged and allowed to stand, with the stop valve open, and all valves set as in preparation for a run at full speed, for twelve (12) hours, and then again

weighed. The loss of weight due to the leakage of air during the twelve (12) hours shall not be more than five (5) pounds.

(c) Oil tests of pipes, etc.: All pipes, valves, and oil cups subject to full flask pressure shall be tested to three thousand (3,000) pounds oil pressure per square inch. All pipes, valves, and oil cups subject to working pressure shall be tested to three thousand (3,000) pounds oil pressure per square inch. Heater pots shall be tested to three thousand (3,000) pounds oil pressure per square inch without deformation.

(d) Expansion of flask: Each torpedo when fully charged with oil to twenty-two hundred and fifty (2,250) pounds per square inch must pass through a ring gauge nine (9) inches in length and not more than forty-seven thousandths (.047) of an inch greater than the specified diameter of the torpedo; nor shall the diameter of the torpedo at any point in the cylindrical part be less than the said specified diameter.

(e) Stability: The stability of each torpedo shall be shown by heeling the torpedo each way in water tank at an arm of nine (9) inches, the minimum weight to be used to give the maximum heel to be sixty (60) pounds. This test shall give at least these results with the flask charged and uncharged, and with both the exercise head and loaded war head.

(f) Buoyancy: To test the torpedo for buoyancy it shall be prepared as for an exercise run, with submerged guide attached, and charged to thirteen hundred (1,300) pounds per square inch air pressure, and in every respect ready for running, with the
672 gyro dummy in place. The water and alcohol compartments shall be half full. The temperature of the torpedo and of the air charge must be the same as that of the water in which it is immersed. When thus prepared, it must have one (1) pound reserve buoyancy when floating in water of a specific gravity of 1.026 at 62 degrees F., with a pressure in the flask of thirteen hundred (1,300) pounds per square inch at that temperature. A similar test, with the torpedo in every respect ready for a war shot, the air flask charged to thirteen hundred (1,300) pounds per square inch of air pressure, must give the same results.

(g) Trim: To test the torpedo for trim it shall be prepared for an exercise shot, with the air flask charged to thirteen hundred (1,300) pounds pressure, and placed in a water-tank, where it must float horizontally; and the same test must give the same results when the air flask is empty. Such tests as the Chief of the Bureau of Ordnance may direct shall be made to insure that the torpedo with the war head attached possesses the same properties as to stability, buoyancy, and trim as when it is in the exercise condition.

(h) Dynamometer tests: Each torpedo shall be placed in a tank surrounded by sea water, with the tail removed for that purpose; its driving shaft shall be coupled to a recording dynamometer of sufficient capacity to register twenty-five (25) per cent. more than the full power of the turbine and fifty (50) per cent. excess of speed when run under service conditions. Not less than four (4) consecutive runs shall be made with the torpedo thus connected, and three (3)

of these runs shall be made with full working pressure in the air flask and with the superheater in operation. The following data must be continuously recorded on suitable cards, viz, the
673 turning energy or torque, the revolutions of the shaft per minute, and the duration of the run.

After the torpedo has run in the tank for an interval of time which would permit it to cover one hundred and twenty (120) yards if in free route, it shall have attained not less than one hundred and five (105) horse power, or show an excess more than one hundred and twenty-five (125) horse power. The duration of this test, with the superheater in operation, shall not be less than three and one-half ($3\frac{1}{2}$) minutes.

The engines shall be subjected to a further test to show that they are sufficiently strong to stand one hundred and fifty-five (155) horse power for a period of not less than thirty (30) seconds.

Speed test.—The turbines shall be run at a speed of nineteen thousand (19,000) revolutions per minute for a period of thirty (30) seconds without damage or deformation. This stand test to be independent of the dynamometer test.

(i) Cut-off test: A stand test of the cut-off shall be made by means of a motor to prove that the cut-off will operate between speeds of sixteen hundred and fifty (1,650) and seventeen hundred and fifty (1,750) revolutions per minute, and that the cut-off will act between the limits of speed set forth and will not act until the lower limit of speed has been reached.

(j) Running tests: Each torpedo shall be mounted on a stand in such manner as to allow it to be swung around the horizontal and vertical axes through its center of gravity. When so mounted, the gyroscope shall be spun and the engines run. In this run, the gyroscopic steering gear shall demonstrate its capacity to properly control the vertical rudders, both for direct and for wide angle fire.

for a period of at least five (5) minutes, the immersion gear
674 to operate the horizontal rudders and the unlocking gear to unlock the immersion mechanism.

(k) Gyro test: Each gyroscope shall be mounted upon a suitable stand and, being spun three (3) consecutive times, shall be so adjusted as to maintain its initial plane of rotation for a period of not less than ten (10) minutes each time and with a deviation during each time of not more than one (1) degree of arc to each side of the initial center line, the gyroscope to be continuously operating the rudder mechanism throughout the tests against a pressure of at least twenty (20) pounds.

After the acceptance test at Sag Harbor, and before final shipment for delivery to the Naval Torpedo Station, each torpedo and gyro shall successfully pass the requirements of one five (5) minute run and one ten (10) minute run, respectively, in accordance with the requirements of sub-paragraphs (j) and (k).

(l) Rigidity test: Each torpedo shall be subject to a bending stress along the vertical and horizontal planes by a weight of twelve hundred (1,200) pounds applied at the center of the tail guides while the torpedo is rigidly held at the top guide stud on the air

flask without any signs of straining or tendency to leak when subjected to test (m) immediately afterwards.

(m) Leakage test: Each torpedo, without the head, shall be immersed in a tank and submitted to an external hydraulic pressure of seventy-five (75) pounds per square inch for one-half ($\frac{1}{2}$) an hour; leakage not to exceed four ounces. During this test the afterbody shall be in condition for a service run from a submerged tube with freedom of movement of all working parts.

675 (n) Regulator spring test: The springs used for the regulator valves shall be fully compressed and the set noted. The springs shall then be subjected to the maximum working load for a period of twelve (12) hours without any further set taking place. Each spring to be tested by the jumping test, i. e., springs to be jumped to fifty (50) per cent. more compression than the maximum compression in service.

Service Trials of Torpedoes.

88. Service trials.—Each torpedo shall be subjected to the following service tests before acceptance:

(a) One torpedo of each lot of five (5) shall be given three (3) successive runs over a range of four thousand (4,000) yards without change of adjustment between the runs, and must make an average speed of not less than thirty-two (32) knots over the range on each run. The speed made on any one of the three runs shall not vary from the average speed of the three runs by more than one (1) knot. The deflection of the torpedo in a horizontal plane on any one of the runs shall not exceed ten (10) yards at one thousand (1,000) yards, twenty (20) yards at two thousand (2,000) yards, thirty (30) yards at three thousand (3,000) yards, and forty (40) yards at four thousand (4,000) yards, respectively, to the right or left of the aiming line. After the first two hundred (200) yards from the point of launching have been covered, the torpedo shall not deviate more than eighteen (18) inches from the indicated setting of the depth index, to and including the two thousand yard net, nor more than twelve (12) inches above or twenty-four (24) inches below the indicated setting of the depth index, to and including the four thousand yard net, for each
676 run made at set depths of from five (5) to ten (10) feet, inclusive, and not more than twenty-four (24) inches from the indicated setting of the depth index for each run made at set depths of from eleven (11) to twenty-three (23) feet, inclusive. The inspector may direct the setting of the depth index for each run if he so desires.

(b) The inspector of ordnance, or an assistant inspector, shall designate at the firing range which torpedo of a lot of five shall be required to make these three acceptance runs. Each one of the other torpedoes of the lot of five shall make one straight run over a range of four thousand (4,000) yards, with an average speed of not less than thirty-two (32) knots, and shall conform in all respects to the requirements prescribed above for lateral and vertical

deviations of straight runs. Each torpedo which makes such a run and does conform to the requirements as set forth above will be accepted.

After passing the test prescribed above, one torpedo of each lot of five shall make one curved run to the right and one curved run to the left without change of adjustment, except the necessary setting of the gyro gear. In making the curved shots the air flask shall be fully charged, the regulator shall have the same setting as on the straight shots, and the superheater shall be in operation. The gyro gear shall be set to ninety (90°) degrees on the index outside the torpedo for each curved run, and the tactical radius and the direction of the torpedo along the tangent to its turning circle taken at ninety (90°) degrees on each curved run. The torpedo shall complete its ninety (90°) degree turn with an advance of not more than one hundred and fifty (150) yards from the launching tube. The deviation of the torpedo to the right or left of the tangent line perpendicular to the line in prolongation of the

677 axis of the launching tube shall not exceed twenty (20) yards at a range of one thousand (1,000) yards.

The inspector of ordnance may direct the curved fire runs described in the above paragraph to be made at any angle not to exceed thirty (30°) degrees. The torpedo shall make the prescribed turn and shall then pursue a practically straight course to the four thousand (4,000) yard net. The deviation at four thousand (4,000) yards shall not exceed fifty-five (55) yards to the right or left of the center buoy. The contractors may make the necessary allowance in the tube setting in order to correct for the advance in turning. This allowance must be the same for the same angle.

(c) In case a torpedo fails to meet the acceptance requirements in the first run over the range as set forth under (b), then this torpedo shall be required to make two successive runs over the range without change of adjustment and fulfill the requirements as set forth above for vertical and lateral deviations of straight runs. These two successive runs must be accomplished within five consecutive runs, including the first trial run. Each torpedo which complies with the requirements of this paragraph shall be accepted.

(d) In case a torpedo fails to make two successive runs and meet the acceptance requirements of the specifications as set forth under (c), then this torpedo will be required to make three (3) successive runs without change of adjustment over the four thousand (4,000) yard range and meet the requirements relating to range and lateral and vertical deviations as set forth under (a).

(e) In all straight runs the torpedo's course shall be practically free from sheers.

(f) The time for the speed will be taken from the moment the tail of the torpedo leaves the launching frame or tube.

678 (g) The expression "without change of adjustment" shall be construed to exclude the disassembling of gyro gear for cleaning purposes. Gyro gear may be cleaned, but must not be

disassembled or adjustment changed. Gyro bearings may be removed for cleaning, but no change of adjustment will be made.

(h) Steadiness of performance as to speed. In each straight run prescribed under the specifications, the torpedo shall be timed at distances of one, two, three and four thousand (1,000, 2,000, 3,000, and 4,000) yards from the launching point. The speed of the torpedo from the launching point to any one thousand (1,000) yard net shall not vary more than two (2) knots from the mean speed for the four thousand (4,000) yards. The speed for any one thousand (1,000) yards measured at the net shall not vary more than four (4) knots from the mean speed for four thousand (4,000) yards. After the first two hundred (200) yards from the point of launching have been covered, the torpedo shall not deviate more than eighteen (18) inches from the indicated setting of the depth index, to and including the two thousand (2,000) yard net, nor more than twelve (12) inches above or twenty-four (24) inches below the indicated setting of the depth index, to and including the four thousand (4,000) yard net, for each run made at set depths of from five (5) to ten (10) feet inclusive, and not more than twenty-four (24) inches from the indicated setting of the depth index for each run made at set depths of from eleven (11) to twenty-three (23) feet, inclusive. The inspector of ordnance may direct the setting of the depth index for each run if he so desires.

(i) The number of trial runs, whether preliminary or acceptance, is limited to forty (40) for each torpedo, and any torpedo which shall have failed to pass the service trials after making forty (40) runs shall be rejected, and the parts thereof shall be treated as condemned material as provided in clause 13 of these specifications, but the bureau may authorize the use in other torpedoes of such parts as have not been subjected to wear and of which the failure of the torpedo is not attributable.

(j) Flasks are to be submitted in lots of five, and payments made thereon in accordance with the contract.

Any of the above flasks, without regard to the original lot submitted, are to be assembled, in torpedoes for shop tests in lots of five, and payments made thereon in accordance with the contract.

Any of the torpedoes thus assembled and given the shop tests may be submitted in lots of five to the inspector for the service trials at Sag Harbor, in accordance with the specifications. This whole lot of five as thus submitted for trials will be passed before any or all of the lot of five will be accepted, and the payments made therefor in accordance with the contract, except where otherwise provided for in the contract or specifications. The torpedoes so submitted in a lot of five for acceptance runs may be fired in any order the company may desire.

The inspector on the barge will select from each lot of five (5) thus submitted a torpedo to be given the successive runs, the curved fire runs, etc., provided for in the specifications, and he may make such selections at the time, either when the torpedo of the lot is ready to be given its service straight run or having passed its straight run; and if these selections of the torpedoes are not made

680 before the last torpedo of the lot of five is submitted, then the last torpedo of this lot of five submitted shall make the acceptance runs provided for in clause 88.

In case of loss or rejection of the torpedoes selected for full acceptance runs as required by clause 88 of the specifications, the bureau directs that the Inspector of Ordnance select any one of the four remaining of this lot, available and not otherwise rejected, to make the full acceptance runs as required by clause 88 of the specifications.

If any torpedoes of a lot of five (5) submitted for acceptance runs are lost or rejected, the question of acceptance of the remaining torpedoes of this lot will be referred to the Bureau of Ordnance; and the bureau directs that if all of the remaining torpedoes of the lot submitted for test have made their straight runs within seven (7) successive runs per torpedo, and have shown a uniform reliability of performance, the remaining torpedoes of the lot may be accepted, provided that any one of the lot has made the full acceptance runs required by clause 88 of the specifications.

(k) No part of the torpedo is to be shifted during its test runs, except when necessary owing to such part being damaged or defective, and such part as is substituted for the damaged or defective part will at once become a permanent part of the torpedo in which it is substituted, and will be marked with the torpedo number if it is a part included in the list of component parts to be marked with the torpedo number.

89. Modification of tests. The Bureau of Ordnance reserves the right to modify both shop and service tests and trials if experience demonstrates that such modification is desirable and necessary in order to safeguard the interests of the contractors or of the Government.

681 90. Apparatus for tests. The contractor shall furnish for carrying out the above tests, launching apparatus and targets and such other appliances and labor as may be necessary.

91. Waiving of tests. The Bureau of Ordnance may waive any or all tests, if it so desires.

92. Manner of conducting tests. All trials of torpedoes shall be made in such manner and by such persons as the chief of the Bureau of Ordnance may elect.

93. Materials to be first class. The material of all articles embraced in the contract of which these specifications form a part shall be of the best quality of their respective kinds and the workmanship shall be first class in every respect.

94. Responsibility for performance. No action of the department or of the Bureau of Ordnance, or of its officers, agents, or representatives, as described herein, shall be construed as in any way relieving the contractor from the responsibility of producing thoroughly efficient and satisfactory torpedoes and articles pertaining thereto, within the meaning and limitation of the contract.

Defects.

95. Faults developed after acceptance. Any parts of the torpedoes which may, during the first year from date of acceptance, be found defective or showing symptoms of weakness, owing to faulty material or workmanship, shall be repaired or replaced by the contractors, at their own expense, or the Bureau of Ordnance may have the work done at any naval station and charge the expense against the contractors, either by deduction from sums due under this contract or any other contract or otherwise.

96. Improvements during construction. If during the
682 manufacture the contractors should have any improvements to propose in any of the material contracted for, the Bureau of Ordnance expects that they will do so, with a view to making the torpedoes as efficient as possible; but no change at all can be made in the types and details as herein specified unless approved by the Chief of the Bureau of Ordnance.

97. Exchange of objects. During the execution of the contract the Bureau of Ordnance is to have the right to exchange objects of one size for objects of another size or type embraced in the contract at contract prices in each case, provided the total amount to be paid to the company is not reduced thereby, and provided the manufacture of the articles proposed to be exchanged has not commenced and that no material has been manufactured for the use of the company in fulfillment of this contract which would be useless to the company if not employed as originally intended. Notice to the company of a desire to exchange as aforesaid must be in writing. If it can be shown to the satisfaction of the Bureau of Ordnance that any proposed exchange would result in pecuniary loss to the contractors, said exchange will not be made unless with reimbursement for the loss.

N. C. TWINING,
Chief of Bureau.

Bureau of Ordnance, Navy Department, June, 1912.

E. W. BLISS COMPANY,
F. C. B. PAGE,
Vice-President.

[SEAL.]

PHILIP ANDREWS,
Acting Secretary of the Navy.

H. C. SEAMAN, *Secretary.*

683

COMPLAINANT'S EXHIBIT 2-A.

*Contract for the Manufacture of 60 Torpedoes for the U. S. Navy,
Bliss-Leavitt, 5-Meter, 21-Inch.*

Contract, of two parts, made and concluded this 16th day of June, 1909, by and between the E. W. Bliss Company, a corporation created under the laws of the State of West Virginia, and doing business in the City of Brooklyn, State of New York, represented by F. C. B. Page, the vice president of said company, party of the first part, and the United States, party of the second part.

Whereas, the proposal of the said party of the first part for the manufacture, test, and delivery of sixty (60) torpedoes, complete in all respects, in accordance with drawings, plans, and specifications approved by the Chief of the Bureau of Ordnance, which torpedoes, for the purposes of this contract, shall be designated and known as the Bliss-Leavitt, 5-meter, 21-inch torpedoes, has been accepted by the party of the second part:

Now, therefore, this contract witnesseth, that for and in consideration of the premises and of the payments to be made as hereinafter provided, the party of the first part, for itself and its successors and assigns and its legal representatives, does hereby covenant and agree to and with the party of the second part as follows, that is to say:

First. The party of the first part will, at its own risk and expense, manufacture in conformity with the aforesaid drawings, plans, and specifications, sixty (60) torpedoes, complete in all parts, appur-

tenances, and spare parts, such torpedoes to be constructed of
684 material of domestic manufacture and in all respects as described in the annexed specifications, and will deliver the said torpedoes f. o. b., Newport, Rhode Island; it being, however, expressly understood and agreed that if any article or thing included in or covered by the drawings, plans, and specifications aforesaid shall be found during the prosecution of the work under this contract to be not produced or manufactured in the United States, and if after reasonable effort it shall be found impracticable to obtain the same as an article of domestic manufacture, then and in such case provision shall be made, by or with the approval of the Secretary of the Navy, for such alterations in the drawings, plans, and specifications, or for the adoption of such new or different device or plan as may be found necessary in order to carry out and complete this contract, subject as to increased or diminished compensation by reason of such change to the conditions applicable to changes as expressed in the second clause of this contract.

Second. The manufacture of said torpedoes shall conform in all respects to and with said drawings, plans, and specifications, which are hereto annexed, and which shall be deemed and taken as forming part of this contract with the like operation and effect as if the same were incorporated herein. No omission in the drawings, plans, or specifications of any detail, object, or provision necessary to carry this contract into full and complete effect shall operate to the disad-

vantage of the party of the second part, but the same shall be satisfactorily supplied, performed, and observed by the party of the first part, and all claims for extra compensation by reason of or for or on account of such extra performance are hereby, and, in consideration of the premises, expressly waived; and it is hereby further provided, and this contract is upon the express condition, that the drawings, plans, and specifications aforesaid may be changed, and that such alterations as are not contrary to law may be made in this contract, by the party of the second part, but no such changes shall be made when the cost thereof in the execution of the work exceeds five hundred dollars (\$500), except upon the written order of the Secretary of the Navy; and if changes are thus made the actual cost thereof and the damage, if any, caused thereby shall be ascertained, estimated, and determined by a board of naval officers appointed by the Secretary of the Navy, and the party of the first part shall be bound by the determination of said board or a majority thereof as to amount of increased or decreased compensation the said party of the first part shall be entitled to receive, if any, in consequence of such change or changes.

[MEM. BY COUNSEL: It is agreed that for the purposes of this case the paragraphs here omitted are substantially identical with the corresponding paragraphs of Exhibit 1, 1905 contract; and that paragraph 19th is word for word the same.]

* * * * *

Authority reserved by the specifications aforesaid to the Bureau of Ordnance or any officer thereof shall be understood to be reserved to the party of the second part.

In witness whereof the respective parties hereto have hereunto set their hands and seals the day and year first above written.

Signed and sealed in the presence of

E. W. BLISS COMPANY,
F. C. B. PAGE,
Vice-President.
N. E. MA.

H. C. SEAMAN, *Secretary.*

THE UNITED STATES,
By BEEKMAN WINTHROP,
Acting Secretary of the Navy.

PICKENS NEAGLE,
Acting Solicitor, as to Beekman Winthrop,
Acting Secretary of the Navy.

Navy Department Seal.

COMPLAINANT'S EXHIBIT 4.

Liber U 75, Page 288.

Assignment.

Whereas, I, Gregory C. Davison, a citizen of the United States, residing at Newport, R. I., have invented certain new and useful improvements in automobile torpedoes, as fully set forth and described in my applications for United States Letters Patent, Number 339,710, filed October 19, 1906, and allowed December 6, 1906, and Number 344,977, filed November 24, 1906, and am the sole owner of the said inventions and all rights thereunder; and whereas, the United States Navy Department, represented by the Secretary of the Navy, is desirous of acquiring an interest in said inventions and in the Letters Patent to be obtained therefor;

Now therefore to all whom it may concern, be it known, that for and in consideration of the payment by the United States Government of the actual cost of obtaining the Letters Patent for the said inventions, I, the said Gregory C. Davison, have sold, assigned, and transferred, and by these presents do sell, assign, and transfer unto the said, the United States Navy Department, represented
687 by the Secretary of the Navy, the full and exclusive right to the said inventions, as fully set forth and described in the applications for Letters Patent numbered and filed as aforesaid, preparatory to obtaining Letters Patent of the United States therefor.

In Testimony Whereof, I have hereunto set my hand and affixed my seal this 27th day of December, nineteen hundred and six.

GREGORY C. DAVISON. [SEAL.]

In the presence of
J. V. CHASE.
S. B. THOMAS.

Acceptance.

The foregoing Assignment of Gregory C. Davison, of Newport, R. I., of the full and exclusive right and interest in and to his inventions in automobile torpedoes, as described in his applications for United States Letters Patent above referred to, is hereby accepted on behalf of the United States Navy Department this sixteenth day of January, nineteen hundred and seven.

TRUMAN H. NEWBURY,
Acting Secretary of the Navy.

In the presence of
S. W. B. DIEHL.
Judge Advocate General.

United States of America, Navy Department.
Recorded, January 21, 1907.

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DEFENDANT'S EXHIBIT 129.

E. W. Bliss Company.

June 9, 1898, Received.

This agreement, made this 23rd day of June, 1898, by and between the Curtis Turbine Company, a corporation organized and existing under the laws of the State of West Virginia, having a place of business in the City of New York (hereinafter called the Curtis Company) first party, and the E. W. Bliss Company, a corporation organized and existing under the laws of the State of West Virginia, and having its principal place of business in the Borough of Brooklyn, City of New York (hereinafter called the Bliss Company), second party.

Witnesseth:

Whereas, the Curtis Company is the owner of the following Letters Patent of the United States, granted upon inventions of Chas. G. Curtis, relating to or applicable to elastic fluid turbines, to wit:—

No. 566,967, dated September 1, 1896.

No. 566,968, dated September 1, 1896.

No. 566,969, dated September 1, 1896.

No. 582,720, dated May 18, 1897.

No. 589,422, dated September 7, 1897.

No. 589,466, dated September 7, 1897.

No. 590,210, dated September 21, 1897.

No. 590,211, dated September 21, 1897.

No. 591,822, dated October 19, 1897.

And of the following applications now pending in the United States Patent Office:

Serial No. 619,741 filed January 19, 1897.

Serial No. 619,743 filed January 19, 1897.

Serial No. 621,628 filed February 2, 1897.

Serial No. 631,481 filed April 9, 1897.

689 Serial No. 646,625, filed July 31, 1897.

Serial No. 666,379 filed January 12, 1898.

Serial No. 667,144 filed January 19, 1898,

and is also entitled by agreement to an assignment of all Letters Patent of the United States that may be granted upon inventions of said Curtis relating to and applicable to elastic fluid turbines, which inventions shall have been made during a certain period.

Whereas, the Bliss Company is engaged in the manufacture and sale of Whitehead automobile torpedoes and desires the exclusive license under the letters patent of the Curtis Company to make, use and vend elastic fluid turbines, as prime movers therefor, and

Whereas, the Curtis Company is willing to grant such license upon the terms and conditions following:

Now, therefore, in consideration of the premises and of the sum

of one dollar paid by each party hereto to the other, the receipt of which is hereby acknowledged, it is agreed as follows:—

First. From and after the execution of this agreement and until its termination as hereinafter provided, the Bliss Company shall have and the Curtis Company agrees to grant to it the exclusive right to make, use and vend elastic fluid turbines as prime movers for the propulsion of automobile torpedoes (that is to say self propelling explosive projectiles whose trajectory is on or in water, and not including any manner of vessel, boat or craft, or any projectile whose trajectory is not on or in water), under the Letters Patent of the U. S., owned by the Curtis Company or which it may hereafter acquire, and for the full term of said Letters Patent and each of them, subject always to the conditions of this agreement.

690 Second. For each turbine made, used or sold under said license the Bliss Company will pay to the Curtis Company a royalty at a rate to be determined from the following schedule in accordance with Sections third and fourth:

* * * * *

In witness whereof, the E. W. Bliss Company and the Curtis Turbine Company have caused these presents to be executed and their corporate seals to be hereto affixed this 23rd day of June, 1898.

CURTIS TURBINE CO.,
By CHAS. G. CURTIS,
Vice-President.

Attest:

LUCIUS C. RYCE, *Secretary*. [SEAL.]

E. W. BLISS CO.,
E. W. BLISS, *President*.

Attest:

W. A. PORTER, *Secretary*. [SEAL.]

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DEFENDANT'S EXHIBIT 160.

(In Evidence April 7, 1914.)

2-390.

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this Office of the File Wrapper, Contents and Drawings in the matter of the Letters Patent of Frank M. Leavitt, Assignor to E. W. Bliss Company, Number 1,088,080, granted February 24, 1914, for Improvement in Driving Mechanism for Torpedoes.

In Testimony Whereof I have hereunto set my hand and caused

the seal of the Patent Office to be affixed at the City of Washington, this 4th day of April, in the year of our Lord one thousand nine hundred and fourteen and of the Independence of the United States of America the one hundred and thirty-eighth.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.

2-437.

Div. 22.

8454.

Number (Series of 1900).
689,136.

(Ex'r's Book) 379/40.

1912.

Patent No. 1,088,080.

692 Name: Frank M. Leavitt, Ass'or to E. W. Bliss Company
of Brooklyn, N. Y., a corp. of W. Va.,
Of Smithtown,
County of ———,
State of New York.

Invention: Driving Mechanism for Torpedoes.

Original.

Renewed.

Parts of application filed.	{	Petition,	April 8, 1912.	—, 191—.
		Affidavit,	" " 1912.	—, 191—.
		Specification,	" " 1912.	—, 191—.
		Drawing, 2 sh'ts,	" " 1912.	—, 191—.
		Model or Specimen,	—, 191—.	—, 191—.
		First Fee, Cash, \$15,	April 8, 1912.	—, 191—.
		First Fee, Cert.,	—, 191—.	—, 191—.
		App. filed complete	Ap'l 8, 1912.	—, 191—.

Examined: J. H. Colwell, Oct. 4, 1913. —, —.

Allowed: W. W. Mortimer, —, —.

For Com'r. For Com'r.

Notice of Allowance, Oct. 9, 1913, 19 —, 191—.

Final Fee, Cash, \$20, Jan. 24, 1914. —, 191—.

Final Fee, Cert., —, 191—.

Patented, February 24, —, —, 1914.

Associate Attorney, Attorney- Fraser, Turk & Myers,
170 Broadway,
New York, N. Y.

[On the margin:] Division of App. No. —, filed —, 191—.

(No. of Claims Allowed, 8. Title as Allowed Driving Mechanism
for Torpedoes.

Class 114-20.

693 \$15.00 C'k Received Apr. 8, 1912. A. Chief Clerk, U. S. Patent Office.

April 5/12,
Div. XXII,
Apr. 10, 1912,
U. S. Patent Office.

689,136, Paper No. 1.

From Fraser, Turk & Myers, 170 Broadway, New York.

Hon. Commissioner of Patents, Washington, D. C.

SIR: We enclose herewith application of F. M. Leavitt for patent for Driving Mechanism for Torpedoes.

The drawings (2 sheets) are also enclosed sent by this mail.

Respectfully,

FRASER, TURK & MYERS.

8454.

Mail Moom,
Apr. 8, 1912,
U. S. Patent Office.

Div. XXII,
App. 10, 1912,
U. S. Patent Office.

689,136, Paper No. 1.

8454.

Application for United States Letters Patent, Petition, With Power of Attorney.

To the Commissioner of Patents:

Your Petitioner, Frank M. Leavitt, a citizen of the United States, residing in Smithtown, in the County of Suffolk, and State of New York, and whose Post Office address is c/o E. W. Bliss Co., cor. Adams and Plymouth Sts., Brooklyn, N. Y., prays that Letters Patent of the United States be granted to him for the Improvements in Driving Mechanism for Torpedoes set forth in the annexed specification:

Registry No. 9664. And he hereby appoints Fraser, Turk & Myers (the said firm comprising Arthur C. Fraser, Henry M. Turk and Eugene V. Myers as its members), of New York City, N. Y., his Attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign his name to the drawings, to receive the Letters Patent when issued, and to transact all business in the Patent Office connected therewith.

Signed at Brooklyn, N. Y., this 2d day of April, 1912.

FRANK M. LEAVITT.

Cl'ms 1, 2.

8454.

A/B.

Specification.

To all whom it may concern:

Be it known that I, Frank M. Leavitt, a citizen of the United States, residing in Smithtown, in the County of Suffolk, and State of New York, have invented certain new and useful improvements in Driving Mechanism for Torpedoes, of which the following is a specification:

This invention provides improved means for driving automobile torpedoes by means of a turbine engine.

An automobile torpedo has necessarily two screw propellers which revolve in opposite directions in order that each may counteract the tendency of the other to cause the torpedo to roll. To ensure that they shall be driven at a uniform speed they are necessarily geared together. For this purpose it has heretofore been customary to introduce four miter gears in the tail section of the torpedo, one of these being fixed upon the engine shaft upon a prolongation of which the after-propeller is carried, the opposite miter being mounted on a hollow shaft carrying the forward propeller, and the remaining miters being idlers for merely reversing the motion from the driving to the driven miter gear. The presence of these miter gears in the tail section is inconvenient, and one object of the present invention is to avoid their necessity.

In the application of a fluid pressure turbine for driving a torpedo it is necessary to gear down from the turbine to the propellers in order that the turbine may revolve at the high speed at which it gives its best efficiency, and the propellers at a very much lower speed. One object of the present invention is to combine the gearing for this purpose with that which is required to maintain the correct ratio of speed between the oppositely revolving propellers.

In driving the torpedo by means of a turbine it is desirable, for reasons fully explained in United States patent to Davison, No. 858,266, granted June 25, 1907, to provide two turbine wheels re-

696 Cancelled Per B.	volving in opposite directions at equal speeds, their weights and dimensions being so proportioned that the sum of the moments of inertia in the one direction may neutralize the sum of the moments of inertia in the reverse direction, thereby eliminating the gyroscopic action which would be liable to interfere with the proper steering of the torpedo. This involves
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wheels shall be connected through gearing in order to maintain a uniform speed ratio between them. The present invention combines the gearing for this purpose with that required for speed di-

minution and for revolving the propellers in opposite directions at equal speeds.

In my patent No. 748,759, of January 5, 1904, and in said Davidson patent, the turbine is mounted upon an axis co-incidental with the major axis or center line of the torpedo. The present invention locates the oppositely revolving turbines in a plane perpendicular thereto so that they turn around an axis transverse to the torpedo.

In the accompanying drawings

Figure 1 is a longitudinal section of the after-portion of the torpedo hull showing the propelling mechanism in elevation.

Fig. 2 is a vertical mid-section of the turbine engine and gearing on a larger scale.

Fig. 3 is a view partly in elevation and partly in section cut on the plane of the line 3—3 in Fig. 2.

Fig. 4 is a diagrammatic view showing the gearing in simplified form.

In the drawings A is the torpedo hull, B, B' are the propellers, C, C' the propeller shafts and D, D' the turbines. The inner shaft C carries the after propeller B while the outer or tubular shaft C' carries the forward propeller B'. The turbine D is mounted on an inner shaft E, while the turbine D' is mounted on a tubular shaft E' surrounding the shaft E. These turbines revolve in opposite

697 directions at preferably [light]* ^{like} Δ speeds. The shafts

E, E' carry respectively pinions F, F', preferably of equal size, and these mesh with relatively large gear wheels G and G' which carry bevel pinions H, H' respectively. These pinions mesh with larger bevel gears J and J' which are mounted respectively on the shafts C and C'. The gears J and J' mesh with both pinions and thus constitute a nest of gearing which serves on the one hand for connecting the turbine wheels D, D' so that these are compelled to revolve in contrary directions at a predetermined speed ratio; and on the other hand to connect the shafts C, C' so that the propellers are compelled to turn in contrary directions at a determined speed ratio. The system of gearing also, by reason of the step down which occurs between the pinions F, F' and the gears G, G', and the second step down which occurs between the pinions H, H' and gears J, J', accomplishes the desired reduction of speed between the turbines and propellers. The entire group of gearing is arranged adjacent to the turbine instead of the reversing gears being located, as heretofore, in the tail section; thus the same gearing serves the triple purpose of reduction gearing, of connecting the turbine wheels that revolve at equal speeds, and of reversing the direction of rotation of the respective propellers and maintaining their rotation at uniform speed ratios.

These several shafts and gears may be variously mounted. In the construction shown the shafts E, E' are carried in bearings a, a' , the bearings a, a' being formed in frames c, c' which are connected at their opposite ends by a yoke d , between which frames is mounted

[* Words and figures enclosed in brackets erased in copy.]

a cross-piece I the opposite end portions of which serve as studs around which the gears G G¹ turn while its middle portion is formed as a hub encircling the shaft C and which may form a bearing *e* for this shaft. This shaft is also shown as having a thrust bearing *f* in a cross-frame *g*, which also forms a bearing *b*. The outer shaft C¹ may have its thrust bearing at *h* against the hub *e*.

Insert B.¹. B¹.

The details of construction may be greatly varied without departing from the essential features of the invention.

The turbine wheels D D¹ require, of course, to have their buckets oppositely pitched in order that the fluid received by the initial wheel D¹ from the nozzle *i* may be reversed in direction and delivered thence into the opposite buckets of the secondary wheel D, this being well understood in turbine construction. The nozzle *i* is shown as formed in a cross-partition or bulkhead K which divides the turbine hull.

Any suitable kind of bearings may be used and any suitable means may be provided for supplying lubricant for these bearings. If in any case the avoidance of gyroscopic effect of the turbine is not deemed important either turbine wheel D or D¹ might be omitted; for example, the secondary wheel D might be omitted with its shaft E, pinion F and gear G, the other parts being retained as shown; in such case the pinion H would serve solely as an idler and might be omitted.

What I claim is:

1. In a torpedo, the combination of a turbine en-
reducing gearing

Per A. ^{driving} ~~gine~~, ^{comprising a bevel pinion} ~~^~~ [a bevel pinion]* driven there-
from, ^{opposite bevel gears driven in} ~~^~~ contrary directions by said pinion, outer ^{said}

and inner propeller shafts carrying ^{said} [the]* respective gears, and propellers on said shafts respectively.

2. In a torpedo, the combination of a
- reducing gearing

Per A. turbine engine, ^{reducing gear} [a bevel pinion]*
comprising a bevel pinion

driven therefrom, a opposite bevel gears driven in contrary directions by said pinion, said gearing located adjacent the turbine and remote from the propellers, outer and inner propeller shafts carry-

“ ing ^{each} [the]* respective gears, and propellers carried on said shafts respectively.

[* Words and figures enclosed in brackets erased in copy.]

3. In a torpedo, the combination of a turbine engine, oppositely revolving propellers, inner and outer propeller shafts carrying said propellers respectively and extending thence forward to near said turbine, and gearing interposed between said turbine and said respective shafts for driving said shafts at reduced speeds in contrary directions from said turbine.

4. In a torpedo, the combination of a turbine engine mounted on a transverse axis, a bevel pinion driven therefrom, opposite bevel gears driven in contrary directions by said pinion, outer and inner propeller shafts carrying the respective gears, and propellers carried on said shafts respectively.

1.

[5.]* In a torpedo, the combination of a turbine engine mounted on a transverse axis, a pinion driven thereby, a gear wheel meshing with said pinion, a bevel pinion driven at reduced speed therefrom, opposite bevel gears driven in contrary directions by said pinion, outer and inner propeller shafts carrying the respective gears, and propellers carried by said shafts respectively.

Cancelled
Per B.

700 6. In a torpedo, the combination of a turbine engine, comprising oppositely rotating turbine wheels, opposite bevel pinions driven from said wheels respectively, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective gears and propellers carried on said shafts respectively.

2.

[7.]* In a torpedo, the combination of a turbine engine, comprising oppositely rotating turbine wheels, pinions connected thereto respectively, gear wheels meshing with said pinions, bevel pinions carried by said respective gear wheels, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective gears, and propellers carried on said shafts respectively.

Cancelled
Sub. B²

8. In a torpedo, the combination of oppositely revolving propellers, a turbine engine comprising oppositely revolving turbine wheels, outer and inner propeller shafts carrying said respective propellers and extending thence forward to said engine and interposed reducing gearing whereby said shafts are driven in contrary directions from said engine, and

together]* to revolve in contrary directions
connected by gearing

Per A. said turbine wheels are \wedge [geared to
tions at a fixed speed ratio.

[* Words and figures enclosed in brackets erased in copy.]

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

H. F. HUGHES.

F. L. COLWELL, JR.

701

Oath.

STATE OF NEW YORK,

County of Kings, ss:

Frank M. Leavitt, the above-named petitioner, being duly sworn, deposes and says that he is a citizen of the United States and a resident of Smithtown, in the County of Suffolk, and State of New York, that he verily believes himself to be the original, first and sole inventor of the Improvements in Driving Mechanism for Torpedoes, described and claimed in the foregoing specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent for said invention has been filed by him or his legal representatives or assigns in any country foreign to the United States.

FRANK M. LEAVITT.

Sworn to and subscribed before me this 2nd day of April, 1912.

[SEAL.]

MOSES ARONSON,

Notary Public, No. 91, Kings County, New York.

702

Div. 22, Room 249.

M. M. S.

2—260.

Paper No. 2.

Address only "The Commissioner of Patents, Washington, D. C., and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention and name of the applicant.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, May 4, 1912.

Mailed May 4, 1912.

Frank M. Leavitt, care Fraser, Turk & Myers, 170 Broadway, New York, N. Y.:

Please find below a communication from the Examiner in charge of your application filed April 8, 1912, for Driving Mechanism for Torpedoes, Serial No. 689,136.

E. B. MOORE,
Commissioner of Patents.

This application has been examined.

Claims 1 to 6, inclusive, are each held as involving no invention over 1,005,647, Jones, Oct. 10, 1911 (114-20); the only variation of the reference needed to fully meet said claims would be the substitution of the well known turbine engine to drive the transverse shaft in lieu of the reciprocating engine shown by the reference, which would not call for the exercise of the inventive faculty. Said claims are therefore rejected.

The statement in line 7, claim 8, that the "turbine wheels are geared together," etc., appears erroneous. However, said claim is met in terms in 748,759, Leavitt, Jan. 5, 1904 (114-20), and is rejected.

Claim 7 will be allowed, as at present advised.

J. H. COLWELL,
Examiner, Division XXII.

S. W. B.

703 Mail Room,
 Apr. 26, 1913,
 U. S. Patent Office.

Div. XXII, Paper No. 3,
 Apr. 28, 1913,
 U. S. Patent Office.*

8454.

In the United States Patent Office.

Applicant: Frank M. Leavitt.
Invention: Driving Mechanism for Torpedoes.
Div. 22, Room No. 249.
Application No. 689,136.
Filed April 8, 1912.

Amendment.

(1.)

Hon. Commissioner of Patents.

SIR: In view of the Examiner's letter of May 4, 1912, the above-entitled application is hereby amended, as follows:

Claims.

Claims 1 and 2, at the beginning of line 2, erases "a bevel pinion" and substitute . . . reducing gearing . . . ; same line, next after "therefrom" insert . . . comprising a bevel pinion, . . .

Claim 1, line 4, next after "carrying" change "the" to . . . said . . .

Claim 2, line 5, next after "carrying" change "the" to . . . said . . .

Claim 8, line 7, erase "geared together" and substitute . . . connected by gearing . . .

Argument.

The Examiner's letter of May 4, 1912, was duly received.
704 Leavitt patent No. 748,759 shows turbine wheels both mounted on the same shaft and hence both revolving in the same direction.

The patent to Jones shows two reciprocating engines, their crank shafts revolving in contrary directions and connected through miter gearing with the two propeller shafts. This necessitates that the engines and propellers revolve at the same speed. To merely substitute turbines for the steam engines would not accomplish the desired result as it is impracticable to drive turbines and propellers at equal speeds.

Both the references were known to applicant before the preparation of this application, and it was thought that the specification and claims were so drawn as to clearly distinguish from both these prior constructions.

Claims 1 and 2 are amended to introduce, in terms, the reducing gearing which is essential in driving a propeller from a turbine. Even without this the claims distinguish from Jones, first, in the use of a turbine engine, and, second, in having a pinion for driving the oppositely revolving bevel gears so that the propeller shafts turn more slowly than the pinion which drives them. Claims 4 and 5 introduce the turbine engine mounted on a transverse axis whereby it is distinguished from the prior Leavitt patent. All these claims involve the reducing gearing. Claims 6 and 8 are thought to be allowable on the same ground as claim 7, which they essentially resemble.

It may be that in some arts the substitution of a turbine for a reciprocating engine is so obvious as not to involve ingenuity; but this is not true of the torpedo art, where conditions prevail which
are so exacting that such substitution or choice of mechanism
705 as are open to engineers in other lines are not admissible. Among these conditions are the extremely contracted space available, the necessity for preserving a given weight so as not to alter the flotation or necessitate any change in displacement of the torpedo; the necessity of generating an extremely high power which must be developed to the maximum almost instantaneously

and which continues altogether only for a matter of two or three minutes; and the necessity of avoiding any interference with the normal action of the steering mechanisms and other devices that are crowded into the limited space available. These exacting conditions necessitate a high degree of ingenuity in providing for them.

Applicant's invention successfully solves the various problems which are presented, and for the first time enables turbines to be used for torpedo propulsion with the utmost simplicity in the reducing and reversing gearing, and by bringing the entire system into one unit. The cited references illustrate merely attempts which, upon analysis, may be said to tend in the same general direction, but which fall far short of achieving applicant's result.

Respectfully submitted,

FRANK M. LEAVITT.

By His Attorneys, FRASER, TURK & MYERS.

New York, April 23, 1913.

A/B.

706

2-260.

Paper No. 4.

Div. 22, Room 249.

MMS.

Address only "The Commissioner of Patents, Washington, D. C., and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention and name of the applicant.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, May 27, 1913.

Mailed May 27, 1913.

Fraser, Turk & Myers, 170 Broadway, New York, N. Y.

Please find below a communication from the Examiner in charge of the application of Frank M. Leavitt, for Driving Mechanism for Torpedoes, filed Apr. 8, 1912, Serial No. 689,136.

E. B. MOORE,

Commissioner of Patents.

Case considered as amended April 26, 1913.

Gearing substantially like that shown herein, except as to the speed reducing feature, which is well known in torpedo and other gearing, connected with the crank shaft of a reciprocating, in lieu of the well known turbine, engine, which does not require speed reduction, and comprising bevel pinions, bevel gears driven in opposite directions by said pinions, outer and inner propeller shafts carrying said respective gears, &c., is shown in the patent to Jones, of record.

It appears that all applicant has done so far as claims 1 to 6, inclusive, and 8 imply, is to have substituted the known turbine engine and the common speed reducing means, which is held as not amounting to invention. Said claims are therefore rejected on the references of record, and for the reasons herein given.

Claim 7 is allowed.

S. W. B.

J. H. COLWELL,
Examiner, Division XXII.

Paper No. 5.

B.

Mail Room
Sept. 3, 1913,
U. S. Patent Office.

Div. XXII,
Sept. 4, 1913,
U. S. Patent Office.

8454.

In the United States Patent Office.

Applicant: Frank M. Leavitt.
Invention: Driving Mechanism for Torpedoes.
Div. 22, Room No. 249.
Application No. 689,136. Filed April 8, 1912.

Amendment.

(2.)

Hon. Commissioner of Patents.

SIR: In view of Examiner's letter of May 27, 1913, the above entitled application is hereby amended as follows:

Specification.

Page 2, erase the matter from "*their weights*" line 6, to "*torpedo*" line 11.

Page 4, insert the following at the end of line 8:

B¹. The frames *c c'* thus support the entire group of gearing between them, and these frames are extended laterally and terminate in feet which are adapted for attachment to some suitable part of the torpedo. The preferred attachment is that shown in Fig. 1, where the feet are formed as perforated bosses engaging the ends of studs fixed to the transverse bulkhead K. The frames *c c'* are preferably of identical construction, being mates. The described construction enables the entire propulsion system to be assembled as a unit exterior to the torpedo and then inserted bodily therein.

Claim.

Erase claims 1 to 4 inclusive.

Cls. 3 to 8.

Change the numbers of claims 5 to 1.

Erase claim 6.

Change the numbers of claims 7 to 2.

Erase claim 8 and insert the following claims:

B². 3. In a torpedo, the combination of a turbine engine mounted on a transverse axis and comprising oppositely rotating turbine wheels, outer and inner shafts therefor, pinions on said shafts respectively, gear wheels meshing with said pinions, bevel pinions carried by said respective gear wheels, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective gears, and propellers carried on said shafts respectively.

4. In a torpedo, the combination of a turbine engine on a transverse axis, a shaft therefor, a pinion on said shaft, a gear wheel and bevel pinion driven therefrom, a transverse fixed stud on which said gear and bevel pinion turn, opposite bevel gears driven in contrary directions from said bevel pinion, outer and inner propeller shafts carrying said respective bevel gears, and propellers carried on said shafts respectively.

709 5. In a torpedo, the combination of a turbine engine comprising oppositely rotating turbine wheels on a transverse axis, outer and inner shafts therefor, pinions on said shafts, gear wheels on a transverse axis meshing with said pinions and having bevel pinions, said gear wheels and bevel pinions turning on a fixed transverse stud, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective bevel gears, and propellers carried on said shafts respectively.

6. A propulsion unit for an automobile torpedo comprising a turbine engine on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said engine and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts adapted to be inserted in or removed from the torpedo as a whole.

7. A propulsion unit for an automobile torpedo comprising a turbine engine having oppositely rotated turbine wheels on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said turbine wheels and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts adapted to be inserted in or removed from the torpedo as a whole.

8. A propulsion unit for an automobile torpedo comprising a turbine engine on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said engine and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts

comprising frames carrying said gearing between them and having feet adapted to be fastened into the torpedo.

710

Argument.

Original claim 7 (now 2), allowed by the Examiner, is distinguished from the Jones patent not only in the substitution of a turbine engine for the reciprocating engines, but also in the introduction of the pinions and gear wheels whereby the speed reduction is effected. Present claim 2 includes two reversely rotating turbine wheels. Inasmuch as Jones shows two reversely reciprocating engines, it is evident that the patentable feature which the Examiner has found in this claim is not due either to the duplication of the turbines or their rotation in contrary directions. Present claim 1 omits merely the limitation to there being two turbine wheels, and to their revolving in contrary directions. It presents therefore the same essential distinctions over the Jones patent that are found in the allowed claim, and its allowance is accordingly logically in order.

New claims are presented herewith which are directed to details of construction and arrangement which are not found in the Jones patent, nor in any prior art.

Claims 6, 7 and 8 are directed to the feature whereby the entire propulsion system is assembled as a unit before being introduced into the torpedo. This is of itself a novel feature and is thought to present unquestionable patentability.

Respectfully submitted,

FRANK M. LEAVITT,

By his attorneys, FRASER, TURK & MYERS.

New York, Sep. 2, 1913.

A./W.

711

2-181.

Serial No. 689,136.

K. O' D.

Address only The Commissioner of Patents, Washington, D. C.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, Oct. 9, 1913.

Frank M. Leavitt, Assessor.

SIR: Your application for a patent for an improvement in Driving Mechanism for Torpedoes, filed April 8, 1912, has been examined and allowed.

The final fee, Twenty Dollars, must be paid not later than six months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this applica-

tion will be withheld, unless renewed with an additional fee of \$15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, distinctly and plainly written, the name of the inventor and title of invention as above given, date of allowance (which is the date of this circular), date of filing, and, if assigned, the names of the assignees.

If you desire to have the patent issue to assignees, an assignment containing a request to that effect, together with the fee for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of five cents 712 each. The money should accompany the order. Postage stamps will not be received.

Final fees will not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

THOMAS EWING,
Commissioner of Patents.

Fraser, Turk & Myers, 170 Broadway, New York, N. Y.

In remitting the final fee give the serial number at the head of this notice.

Uncertified checks will not be accepted.

\$20.00 received as the final fee in the application of E. M. Leavitt, Serial No. 689,136 for Torpedoes, applied from a composite letter No. 17307 received Jan. 24, 1914 from E. W. Bliss Co., Brooklyn, N. Y., which is on file in the Chief Clerk's room.

H. B. BURCH,
Chief of Issue and Gazette Division.

1-24-14.

[NOTE.—Here follow the printed copy of the patent together with the drawings attached thereto.]

2-421—1912.

Contents.

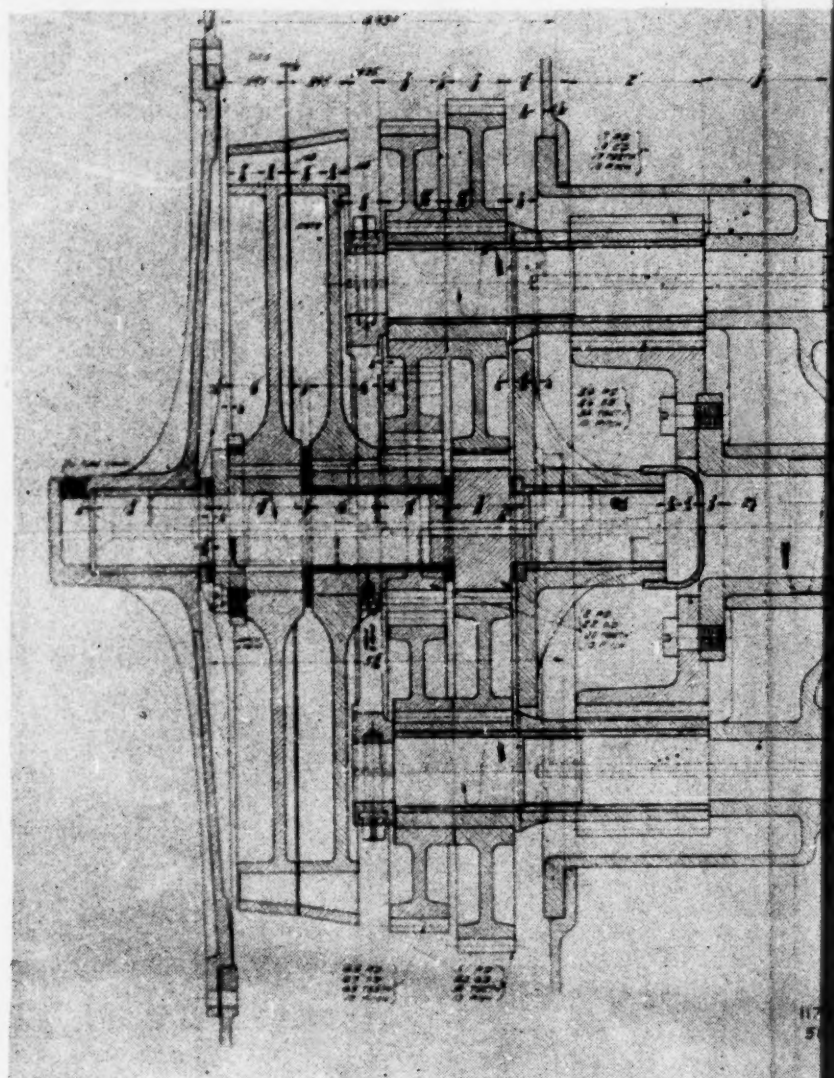
Print

1. Application.
2. Rej.
3. Amendment A.
4. Rej.
5. Amendment B.

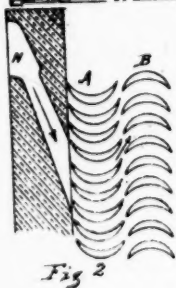
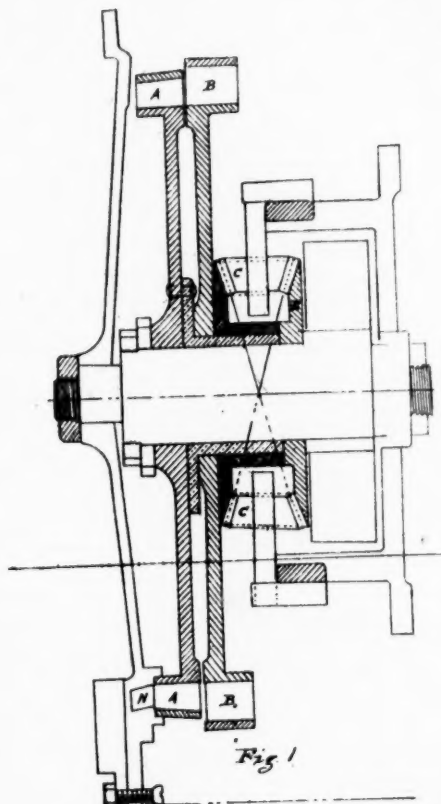
Papers.

- May 4, 1912.
- Apr. 26, 1913.
- May 27, 1913.
- Sep. 3, 1913.

(Here follow diagrams marked pages 713-742.)







*Proposed Method of Balancing
Turbine in Bliss-Leavit
Torpedoes*

*Note: A and E move together, but
being rigidly keyed to turbine
center pinion.*

*B and D move together in
direction opposite to A and E.*

*Spindles for bearings C
attached to gear frame.*

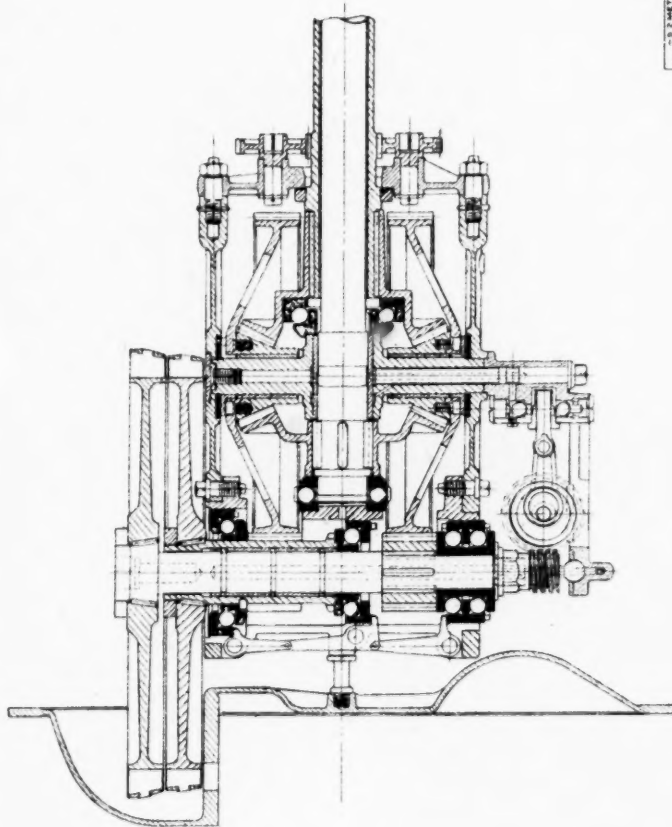
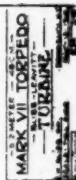
** On Fig. 1, turbine
wheel B should be shown
reversed - i.e. the face of
wheel now up should be forward
so as to reverse direction of
buckets as shown in Fig 2*

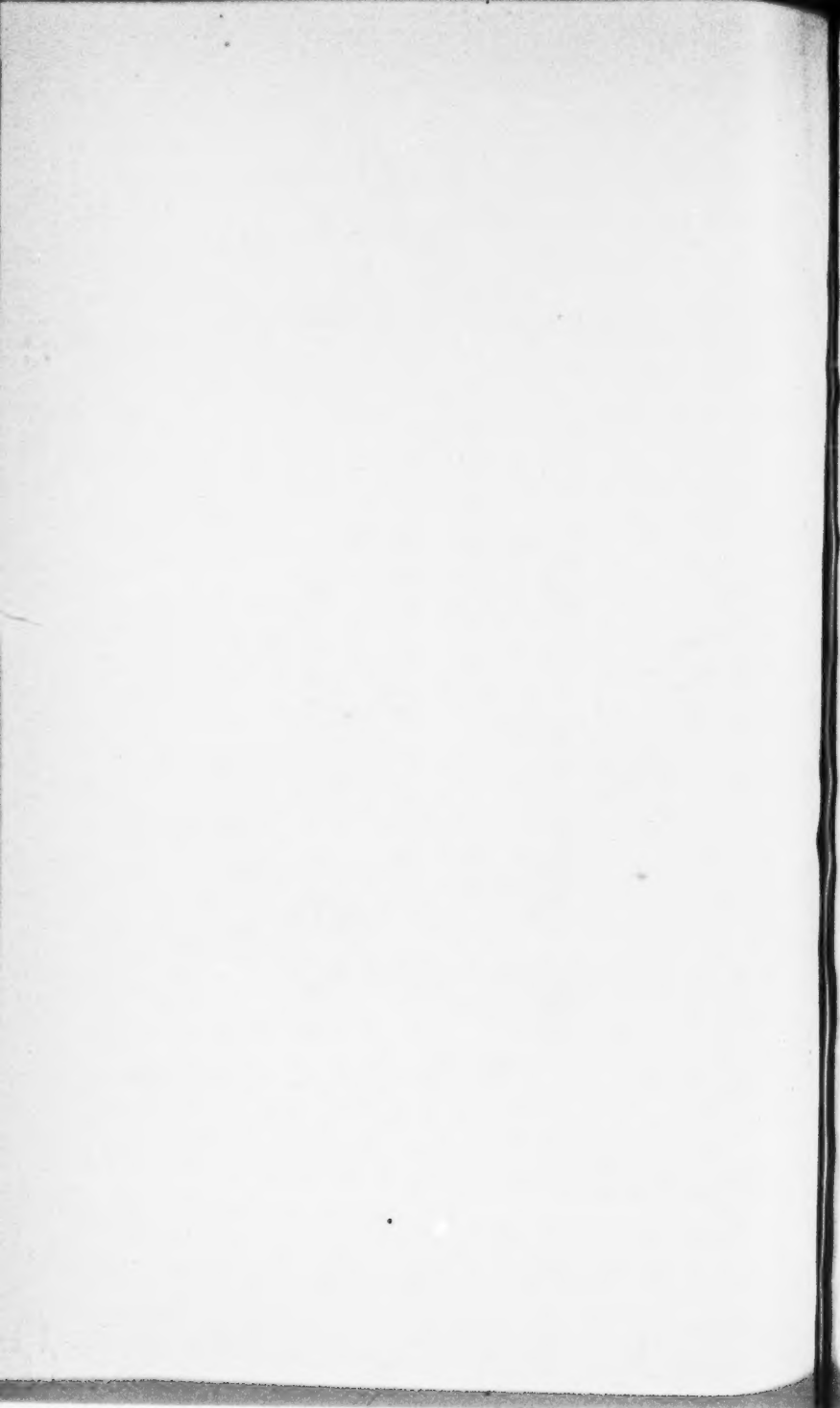
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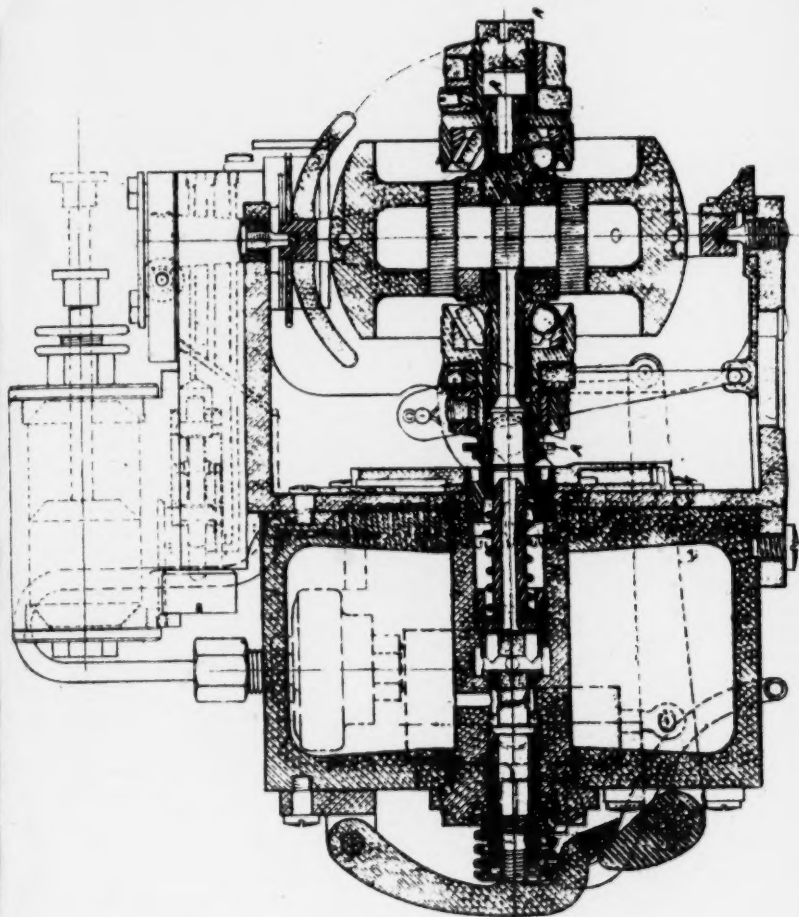
COMPLAINANT'S EXHIBIT 39

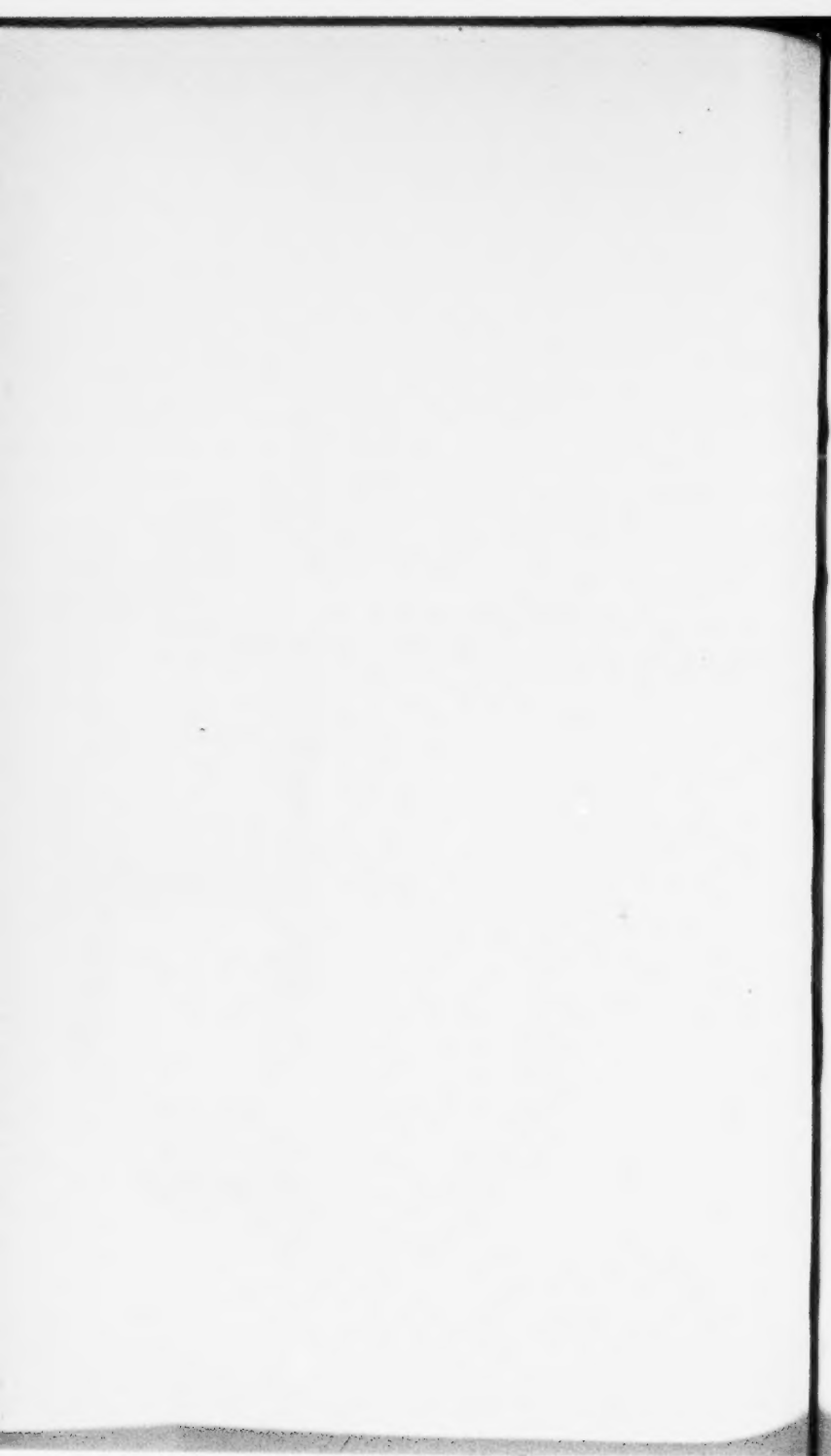




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Complainant's Exhibit 52. 719

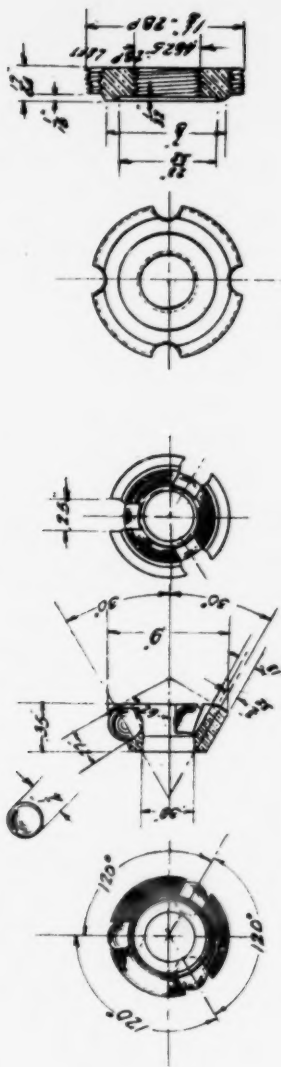




*Complainant's Exhibit 53,
[Portion Showing ball bearings]*

Complainant's Exhibit 53.

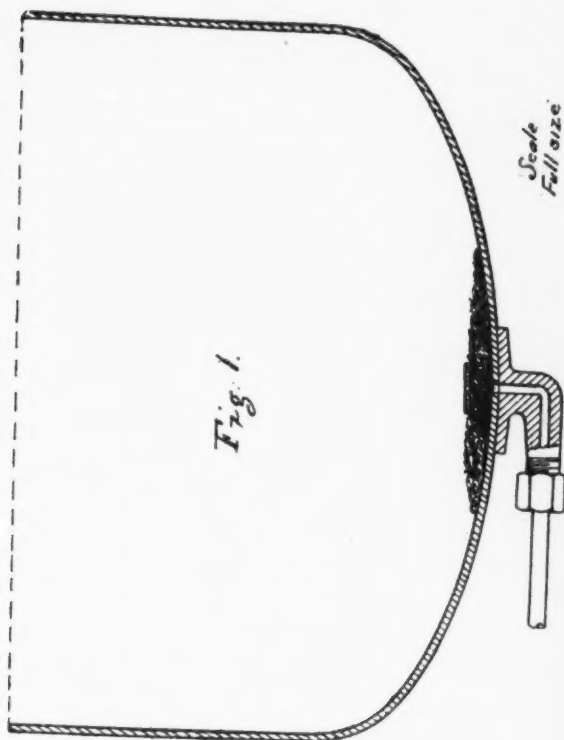
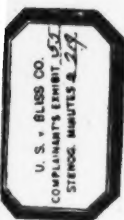
721

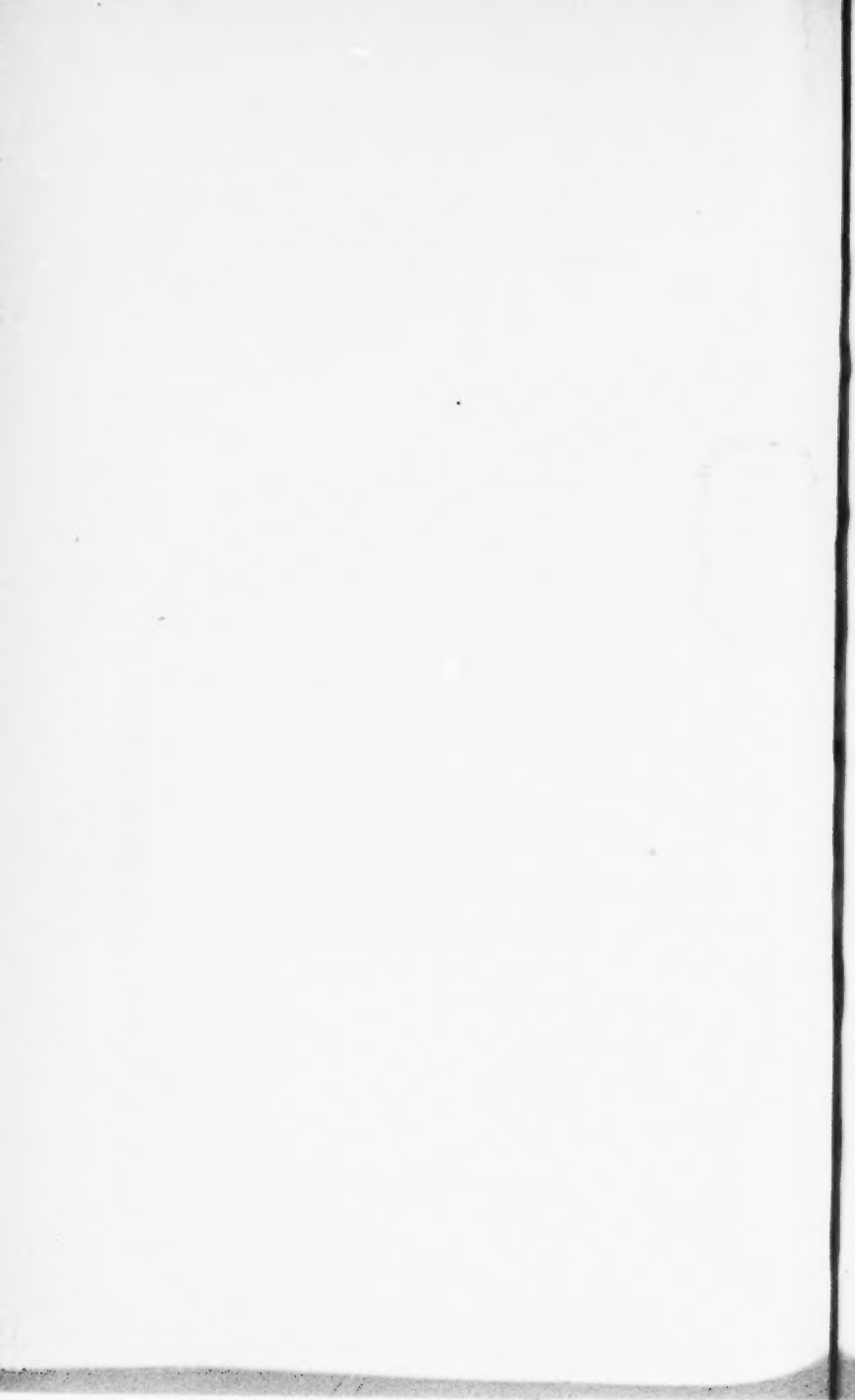


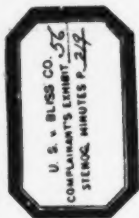


Complainant's Exhibit 55.

463
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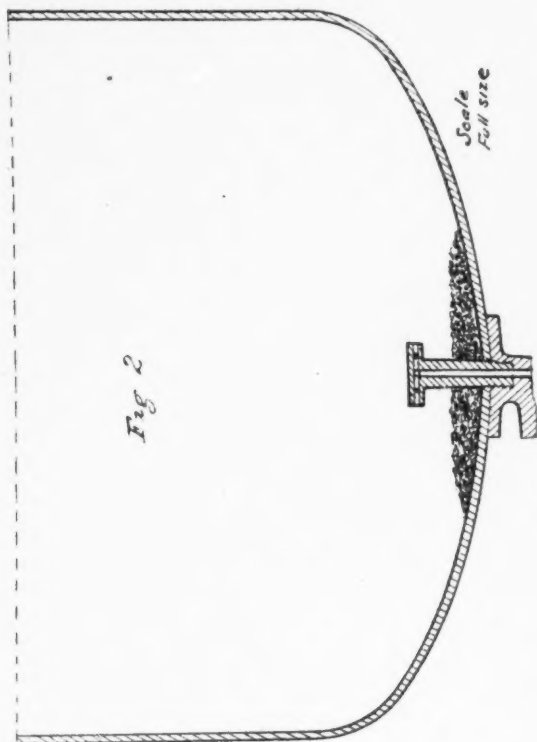


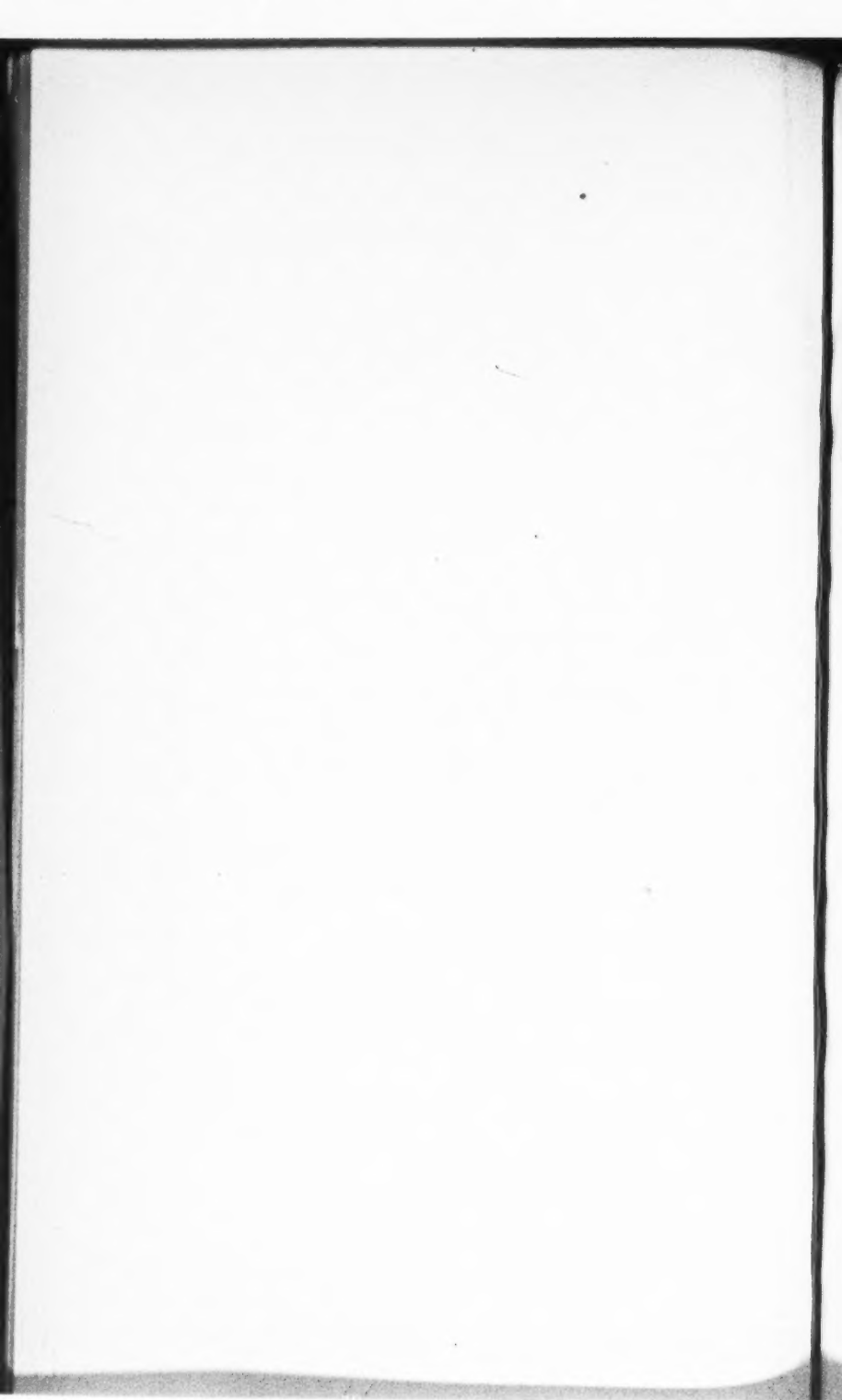




Complainant's Exhibit 56.

725





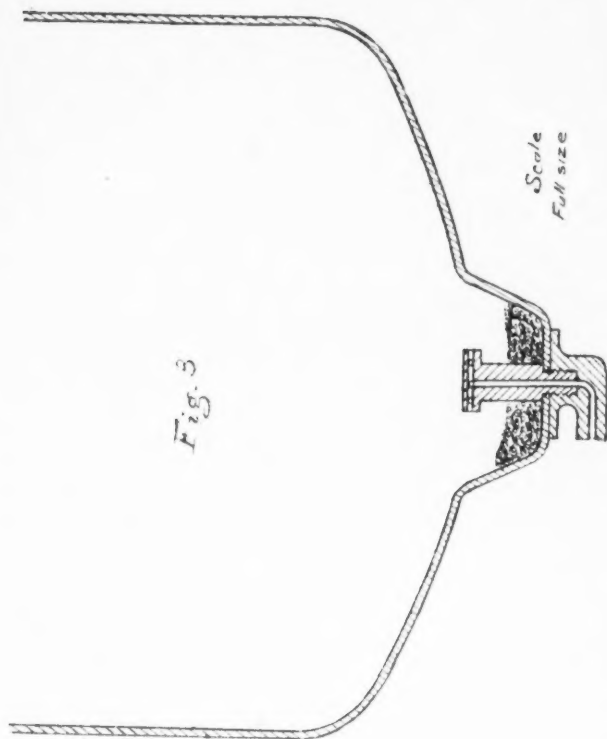
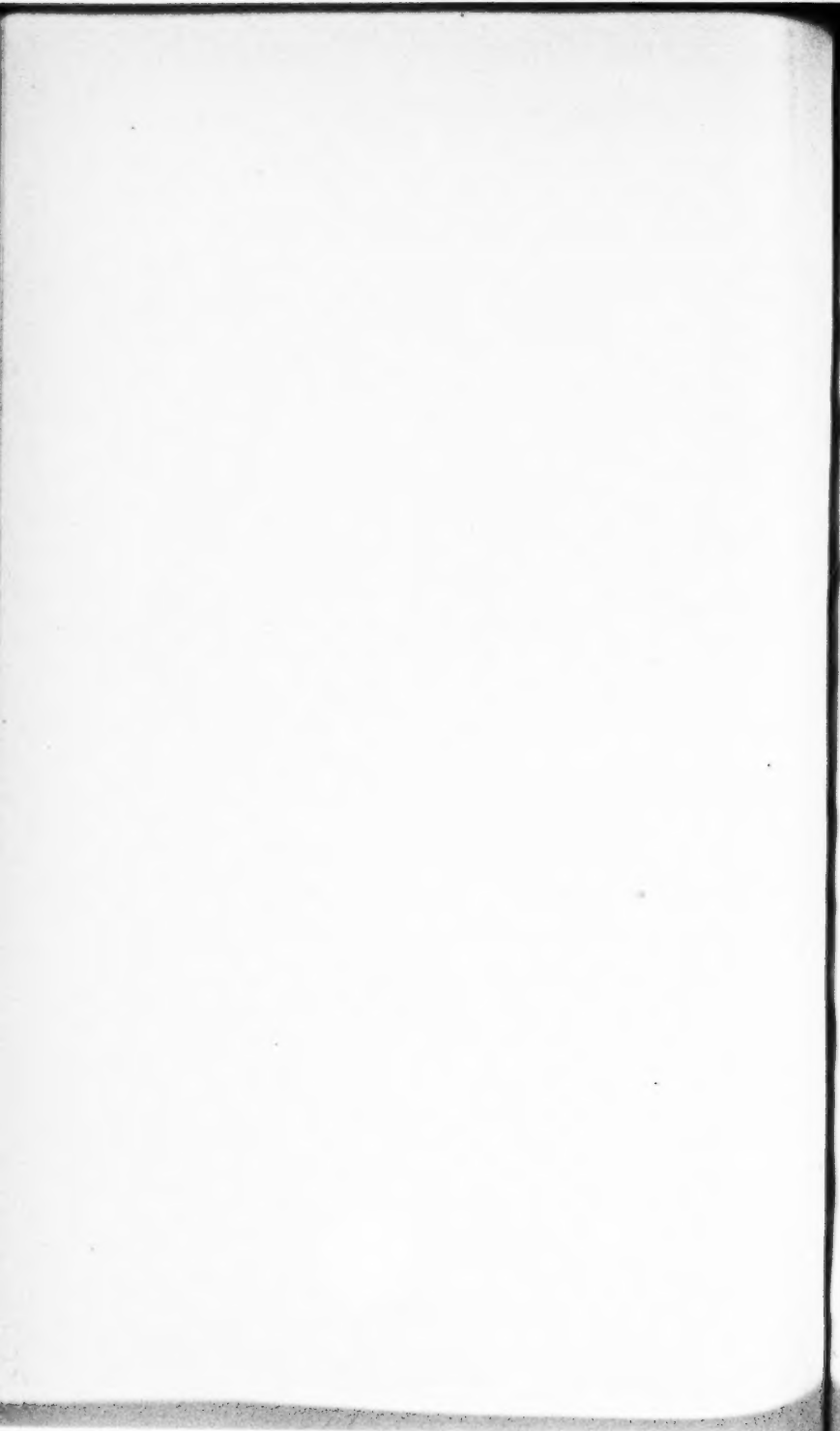


Fig. 3

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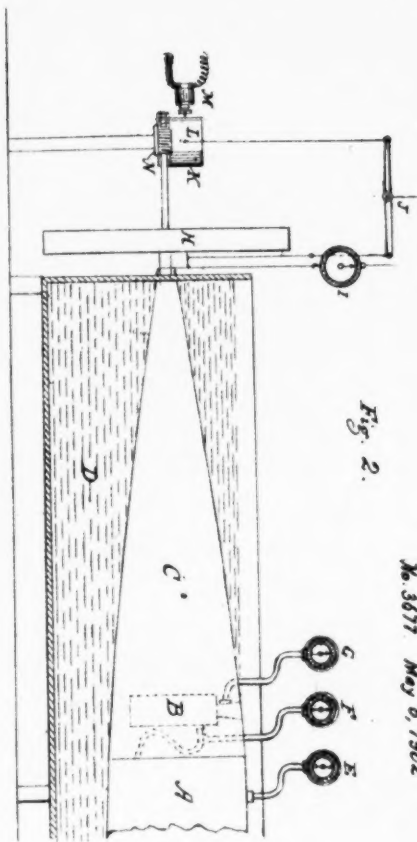


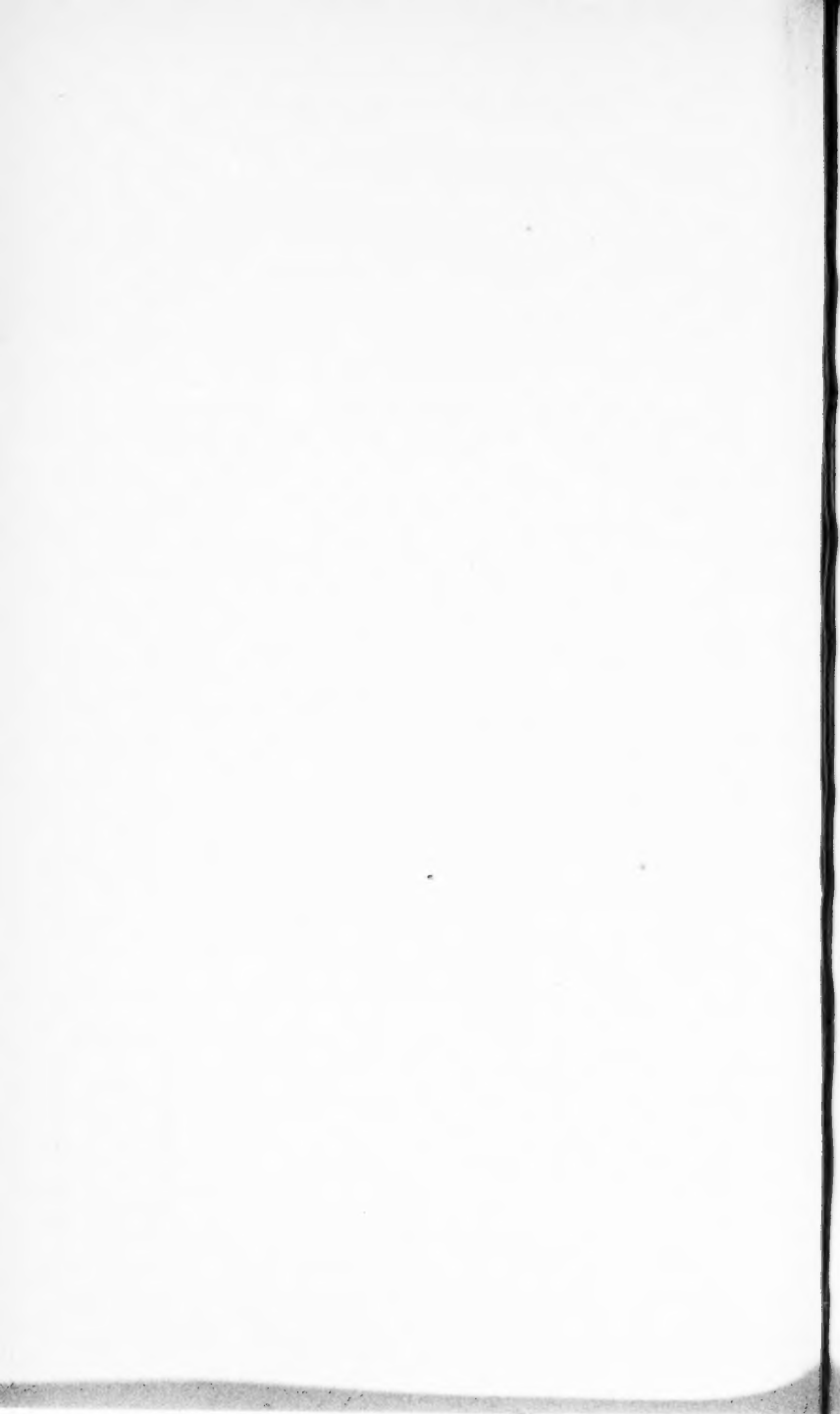
Fig. 2.

No. 3677 May 6, 1902



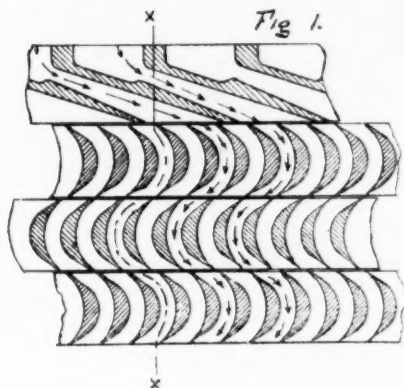
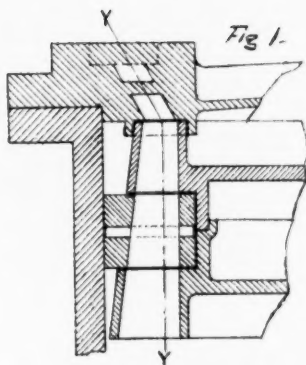
- A-Torpedo air flask.
- B-Turbine
- C-Air body
- D-Tank
- E-Air float pressure gauge
- F-Nozzle
- G-Exhaust
- H-Dynamometer
- I-Spring balance
- J-Lever connecting dynamometer arm with recording pencil.
- K-Recording cylinder
- L-Dynamometer recording pencil
- M-Electro-magnet making seconds of time
- N-Worm gearing revolving drum

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No. 3677, May 6, 1902

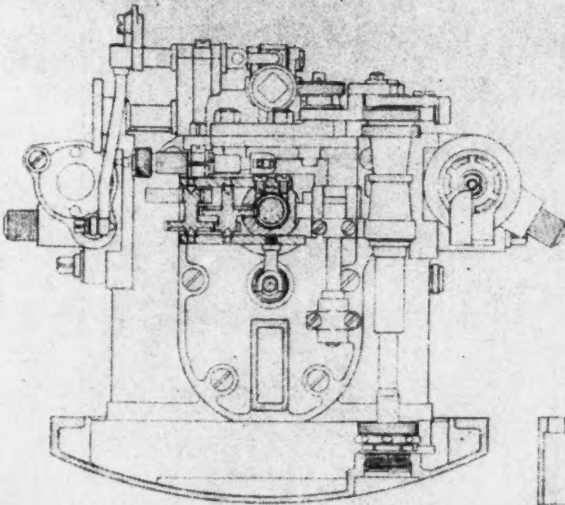
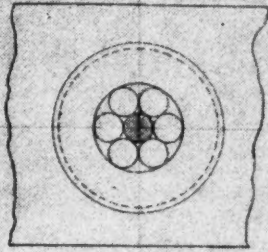
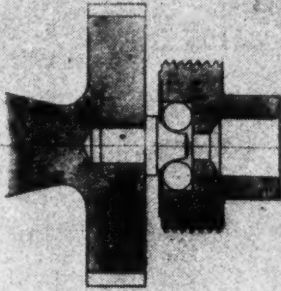


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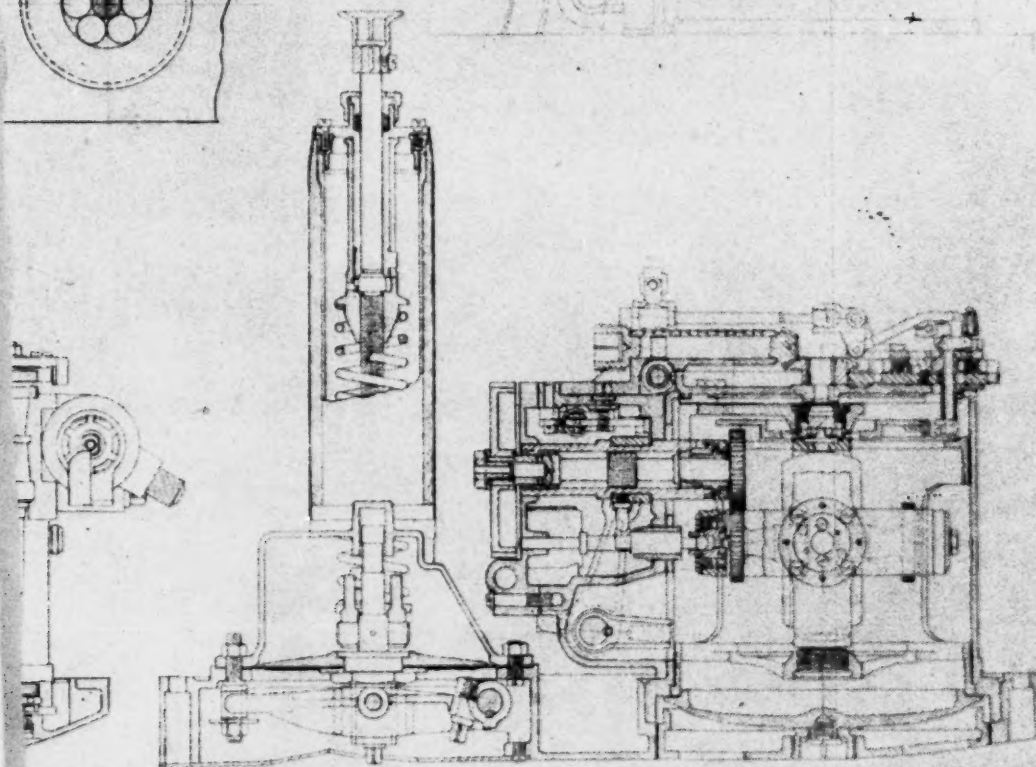
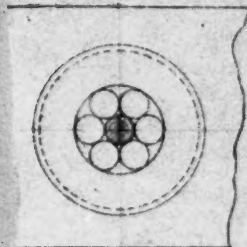
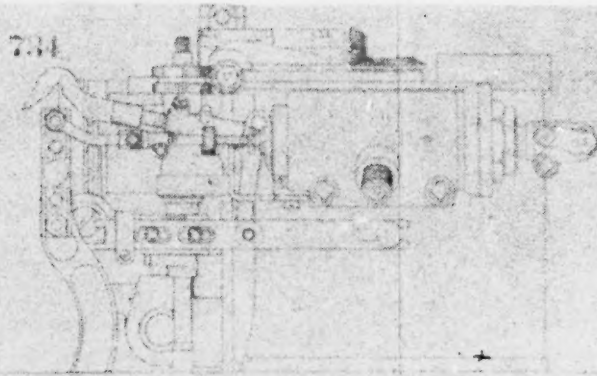
731

DEFENDANT'S EXHIBIT 107



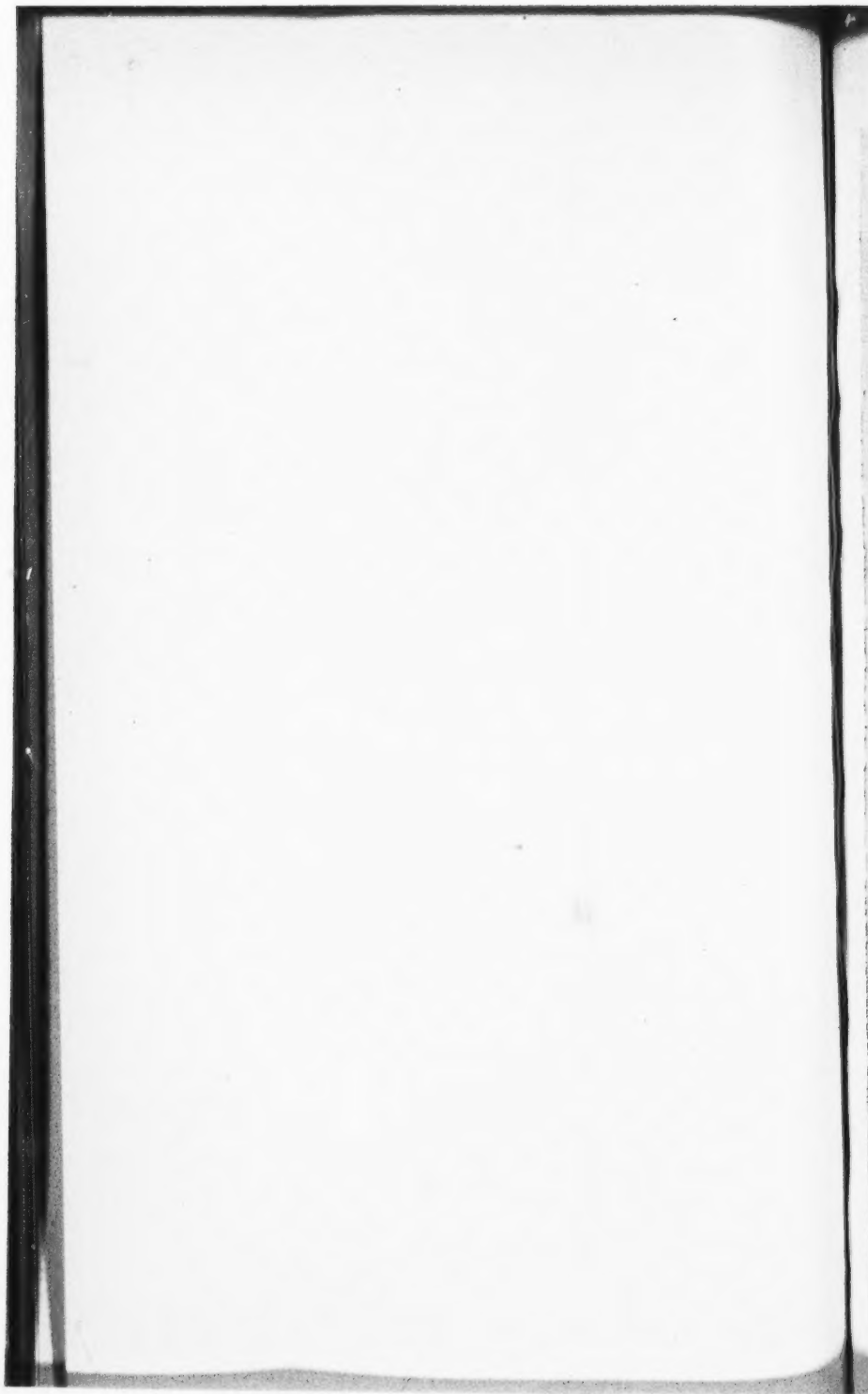
403
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EXHIBIT 107



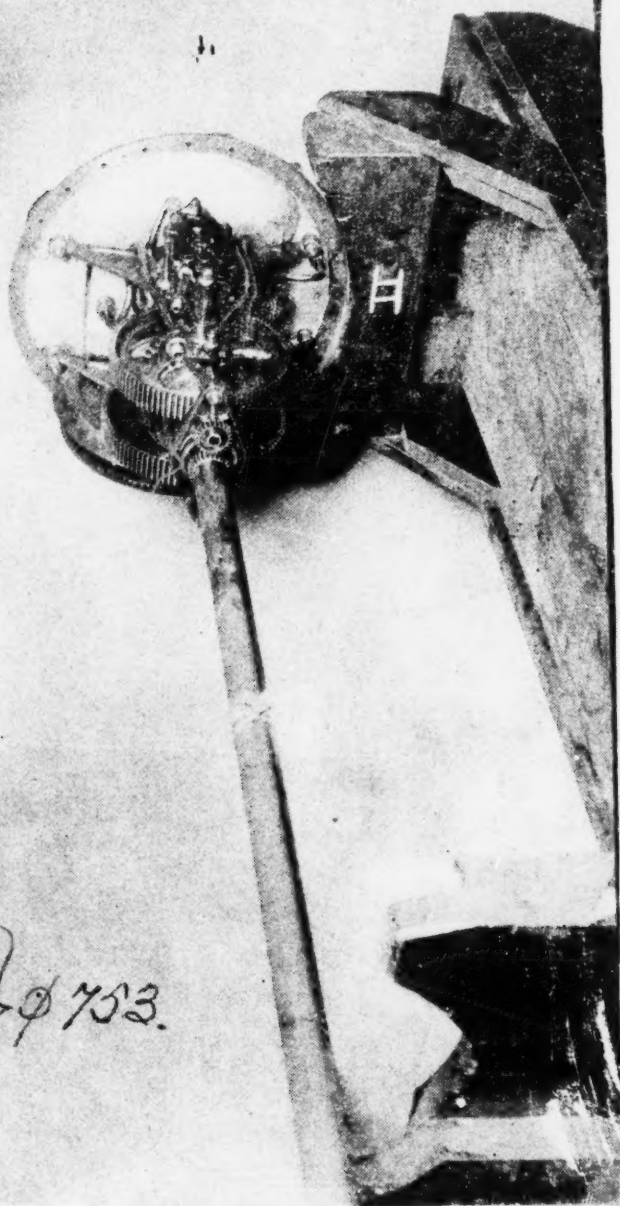
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MARK VII TORPEDO
-GYRO-



Defendant's Exhibit 146a.
Photograph of Exhibit 146.

735



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Defendant's Exhibit 146b.

Detailed Sectional Working Drawing in a Vertical Longitudinal Plane, Full size, of the Turbines and Gearing of Exhibit 146.

737

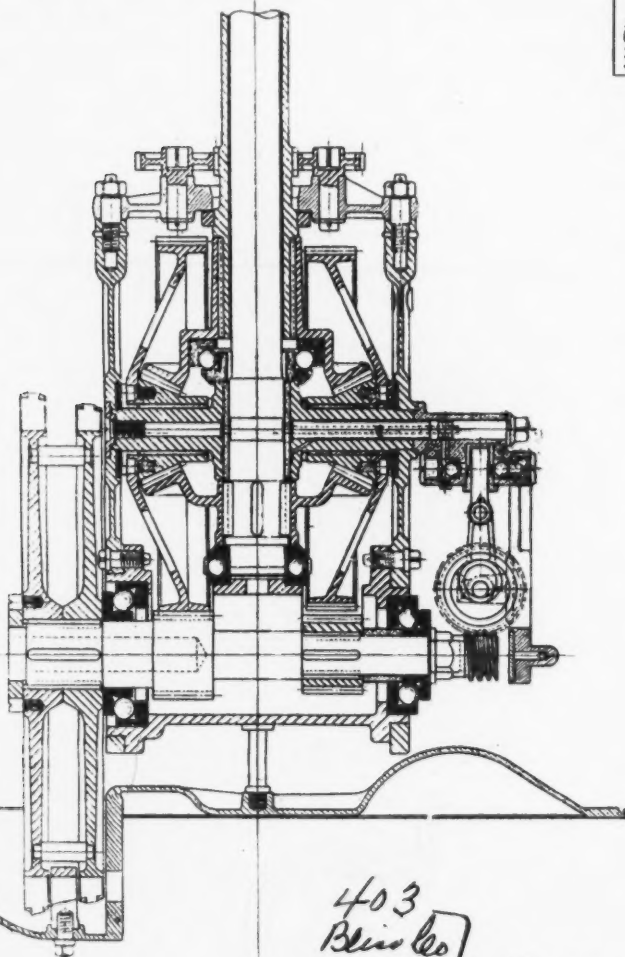
MARK TORPEDO

TURBINE

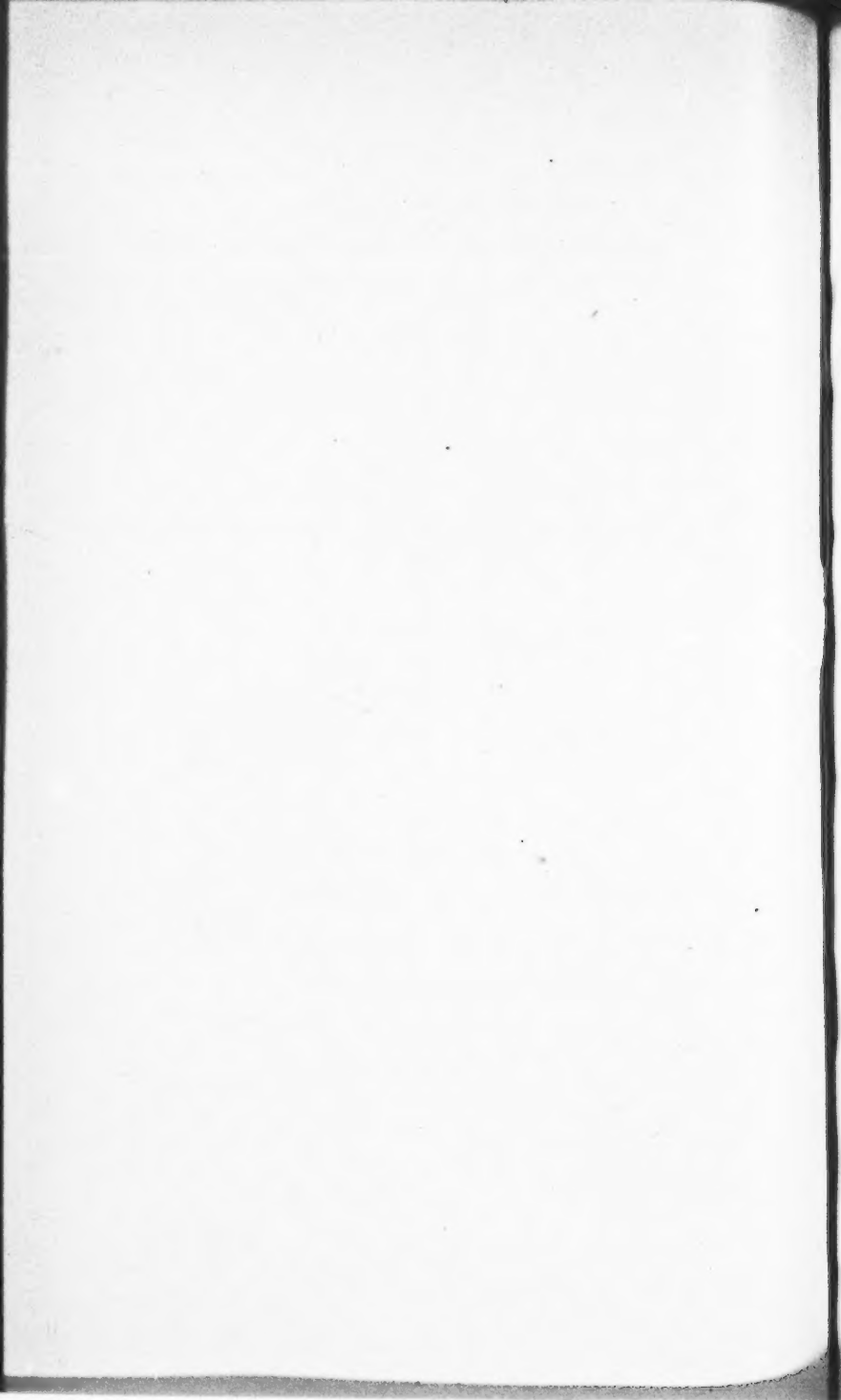
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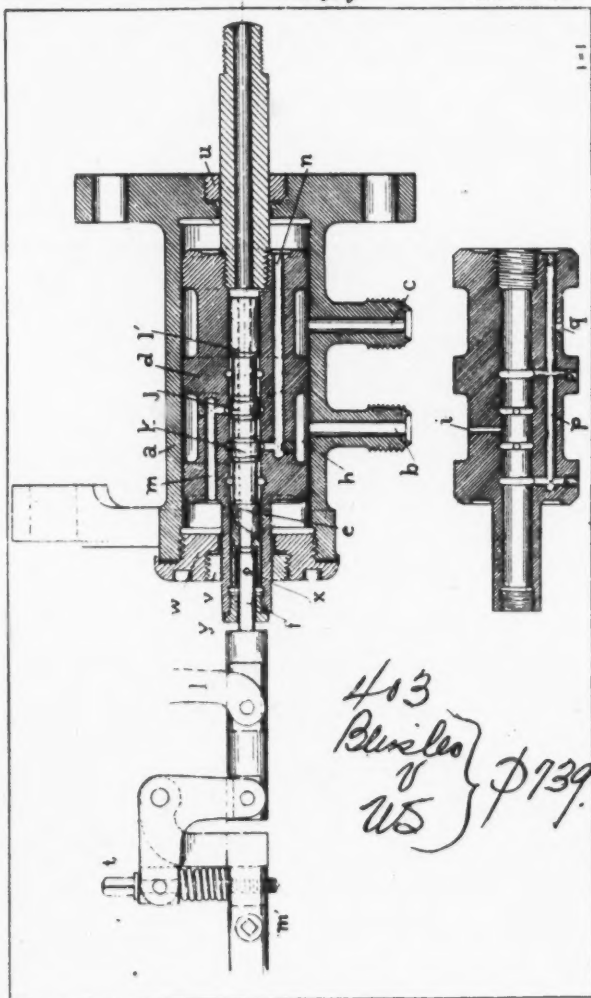


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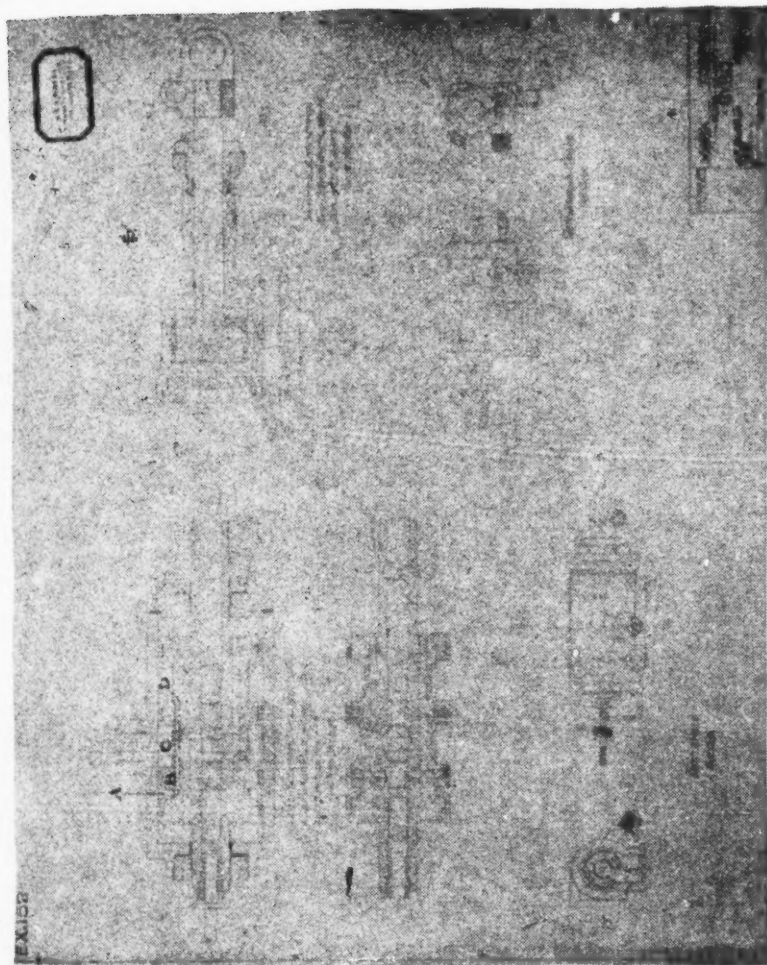
a. b.
W. Blair & Co } *repts. 24, 48 in condenser*
Nov. 24/13 *R. P. Van Dusen*

Defendant's Exhibit 148. Plate XIII, A.



403
 Blair & Co } \$739.
 W. D.





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COMPLAINANT'S EXHIBIT 3.

United States Patent Office.

Gregory C. Davison, of the United States Navy.

Automobile Torpedo.

Patented June 25, 1907.

No. 858,266.

Specifications of Letters Patent.

Application Filed October 19, 1906. Serial No. 339,710.

all whom it may concern:

I, Gregory C. Davison, lieutenant commander, United States Navy, and a citizen of the United States, residing at Newport, in the county of Newport and State of Rhode Island, have invented certain new and useful Improvements in Automobile Torpedoes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to methods of and means for compensating torpedoes driven by turbines, or other forms of rotary engines or other devices, against errors in direction occasioned by the gyroscopic action of the rotating parts.

In a turbine driven automobile torpedo, as at present constructed, there are one or more (generally two) rotating turbine wheels and a driving gear connecting same to one or more (generally two) propellers. These turbine wheels rotate at a very high speed and frequently in the same direction, and with the reduction gearing, the propeller shaft, and other parts driven by the turbines, constitute an effect a series of fly wheels at varying speeds rotating about the same axis, with the sum of the moments of inertia of the various parts in one direction largely in excess of the moment of inertia of the one propeller, which rotates in the reverse direction. Since the interior of the torpedo after being discharged is held temporarily in a yielding medium, the air, and is afterward borne in another yielding medium, the water, the effect of this rotating mass from the interior of the torpedo is to cause the torpedo, as a whole, to act as a gyroscope, and in so acting certain deflecting forces are set up, which, up to the present time, have not been properly compensated, especially with turbine driven torpedoes. In the well known Howell torpedo, which was driven by a rotating fly wheel, set transversely of the torpedo, and which torpedo is described in the Howell patent, No. 311,325, granted January 27, 1885, this gyroscopic action of the torpedo, as a whole, was recognized, and was used to steer the torpedo on a straight course; but the apparatus described in that

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patent, and shown in the Howell torpedo, was not suitable for application to turbine torpedoes as now constructed, and the attempt has been made to rectify such errors by the use of lead ballast, which reduced the carrying capacity of the torpedo, and was otherwise objectionable.

Before attempting to describe the method or means for correcting the error, it might be well to explain briefly the gyroscopic action of a fly wheel, which is rotated in bearings fixed in the shell of the torpedo. As is well known to scientists, if a fly wheel, free to move about the axes of X, Y, and Z, is rotating about any one of these, say the axis of X, and a force is applied, not parallel to the axis of X, tending to deflect the axis of the fly wheel, say in the direction of the axis of Y, then the axis of the fly wheel will not apparently yield to this force, but will tilt about the axis of Z. Now, as stated in the Howell patent aforesaid:—"If the fly wheel revolve about a horizontal axis, and an extraneous force act against the torpedo, so as to tend to turn it about a vertical axis, then the resulting motion of the fly wheel, (supposing the torpedo to yield) will not be about the vertical axis, but about a horizontal axis perpendicular to the plane of the other two axes." In other words, if the shaft of the rotating fly wheel is horizontal and transverse to the torpedo, any lateral deflecting force applied to the torpedo will tend to cause the torpedo to roll about a longitudinal axis; while, if the axis of the revolving fly wheels be fore and aft in the torpedo and horizontal, any lateral deflecting force applied to the torpedo will tend to cause the torpedo to rise or dive, according to the direction of the force, and the direction of rotation of the fly wheel. Again, if the fly wheel axis be transverse of the torpedo and vertical, any deflecting force tending to tilt the nose of the torpedo in the vertical plane will cause the torpedo to swerve or shear to the right or left, according to the direction of rotation of the fly wheel. In other positions of the axis of the fly wheel, the application of a deflective force would cause intermediate deviations, which can be readily followed out by applying the general rules just stated.

Reverting to the turbine driven torpedo, it will be noted that when the torpedo is in the air, after having been released from the torpedo tube, and before it strikes the water, the shell will be free to rotate, and there will be a rapidly rotating mass comprising the turbine wheels and connections mounted in the shell of the torpedo, 754 all or nearly all rotating in one direction, and reaction due to the escaping gases and other causes will cause the shell of the torpedo to rotate in the opposite direction; but since the mass of the shell of the torpedo, with the parts rigidly attached thereto, far exceeds that of the turbine wheels, and the other rotating parts, the angular motion of the shell of the torpedo will be very small in spite of the fact that the angular velocity of the rotating parts is very high; but in practice it has been found that the torpedo shell often rolls, while in the air, through about 45 degrees when fired from the broad side of an ordinary torpedo boat destroyer. As soon as the torpedo strikes the water, if the nose strikes a wave, or if the nose strikes before the tail, if the platform from which the torpedo

has been firing is moving rapidly, there will be a defective force applied to the torpedo, the resultant of which will be in another direction, as already explained. Again, when the propellers, which are rapidly rotating in the air, strike the water, they will act like a sudden brake applied to the driven shafts, and this braking effect will be greatly magnified when it reaches the turbine wheels. Thus if the propellers rotate with one-seventh of the angular velocity of the turbine wheels, the slowing down of ten revolutions on the propellers would mean 70 revolutions on the turbine wheels, and although the mass of these wheels may be small, the kinetic energy is measured by the mass multiplied by the square of the velocity or Mv^2 .

— This sudden slowing down of the turbine wheels will re-act^{2g} on the shell of the torpedo, causing disturbing factors to enter the calculated path of the torpedo.

The rising or the diving of the torpedo can be taken care of within bounds by the immersion apparatus, but the lateral deflection and the rolling of the torpedo about its longitudinal axis are serious objections to turbine driven torpedoes, as hitherto developed. The lateral deflection, which may or may not be wholly or partly occasioned by the roll, frequently causes an initial shear which causes the torpedo to travel at an angle laterally with the calculated path before the automatic steering gear takes charge and brings the torpedo back, not to the true path, but to a path parallel to the true path. This angular deflection often causes the torpedo to miss the target altogether. The roll of the torpedo is objectionable from various standpoints; first, and probably most important, it interferes with the proper relative action of the horizontal and the vertical steering rudders. For instance, if the torpedo rolls through 90 degrees, while in the air, the horizontal steering rudders would then be vertical, and the vertical steering rudders horizontal, and the resulting effect would be wholly objectionable. If the roll is less than 90 degrees, the objection would remain, but in a less degree. Again, if the roll is sufficient, it would obviously interfere with the pendulum ordinarily used in connection with the gyroscope, and it might empty or put out the alcohol lamp for heating up the air fed to the turbine. There are various other objections, which need not be further mentioned, as the remedy proposed is intended to, and does, provide for all of the objectionable gyroscopic effects hereinbefore set out.

My invention consists in substance in so arranging the apparatus, that substantially perfect dynamic stability is secured. In other words, I provide a system built up of a series of oppositely moving parts used in driving the torpedo, so arranged that the sum of the moments of inertia of all the parts rotating in one direction shall balance the moments of inertia of all of the parts rotating in the opposite direction. This is accomplished by the apparatus shown in the accompanying drawings in which the same parts are indicated by the same letters throughout the several views.

Figure 1 shows a side elevation of a torpedo with the driving gear constructed according to my invention, the driving apparatus being

shown in dotted lines; Fig. 2 is a similar view showing diagrammatically another form of driving apparatus constructed according to my invention; Fig. 3 is a vertical longitudinal section through the tail of the torpedo, shown in Fig. 1 with parts being on a larger scale and parts being broken away; Fig. 4 shows a section along the line 4—4 of Fig. 3, and looking in the direction of the arrows; Fig. 5 shows a section along the line 5—5 of Fig. 3, and looking in the direction of the arrows; Fig. 6 shows diagrammatically the double stage turbine indicated in Fig. 3; Fig. 7 shows a section similar to that indicated in Fig. 3, and illustrates a modification of the driving apparatus, including the turbines and reducing gear; Fig. 8 is a diagram showing the double stage turbines used in Fig. 7; Fig. 9 is a view similar to Fig. 7, but shows another modification of the arrangement for driving the propeller shaft from the turbine wheels; and Fig. 10 is a diagram in perspective showing the gearing illustrated in Fig. 9.

A, Figs. 1 to 5, shows the shell of the torpedo carrying the air flask B, and provided with various transverse bearings A^1 A^2 A^3 for gearings, which will be hereinafter described.

C represents vertical rudders or steering rudders, and D represents the web in which the horizontal or diving rudders (not shown) are mounted. The control of the vertical and horizontal rudders does not constitute a part of my present invention, and will not be further described.

(Here follow diagrams marked pages 744, 746, 748, 750 & 752).

755 E E', see Figs. 1 and 3, are two propellers mounted to rotate in reverse directions about a common axis.

E² E³, shown in Fig. 2, are two propellers mounted to rotate in opposite directions about different axes.

Since Fig. 2 shows the apparatus in its simplest form, it will be first described. In this figure, F² F³, are two turbine wheels, which may be single stage or multiple stage as desired, which are mounted respectively on the shafts y y' , each shaft carrying a pinion x x' , which pinions are connected by the gears x^2 x^3 . The turbines F² F³ are caused to rotate in reverse directions, and these gears x^2 x^3 will cause the propellers E² E³ to rotate at precisely the same speed, but in reverse directions, so that if the mass and dimensions of the rotating parts are the same, the moments of inertia in opposite directions will balance each other and dynamic stability will be secured.

It will be obvious that the pinions x x' might mesh directly with each other, thus avoiding the necessity for the idlers x^2 x^3 , but these are inserted for convenience of arrangement in the limited space inside of the torpedo.

While the arrangement shown in Fig. 2 illustrates the operation

No. 858,266.

PATENTED JUNE 25, 1907.

G. C. DAVISON.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 19, 1906.

6 SHEETS—SHEET 1

Fig 1.

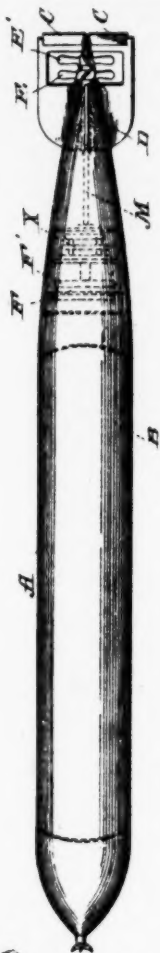
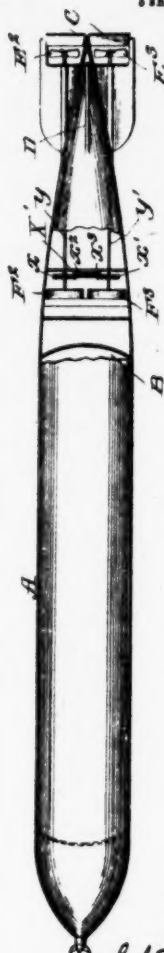


Fig 2.



Witnesses
 Geo. A. Burrell.
 W. Marshall Dwyer.

Inventor,
 G. C. Davison.
 by William & Fisher,
 Attorneys.

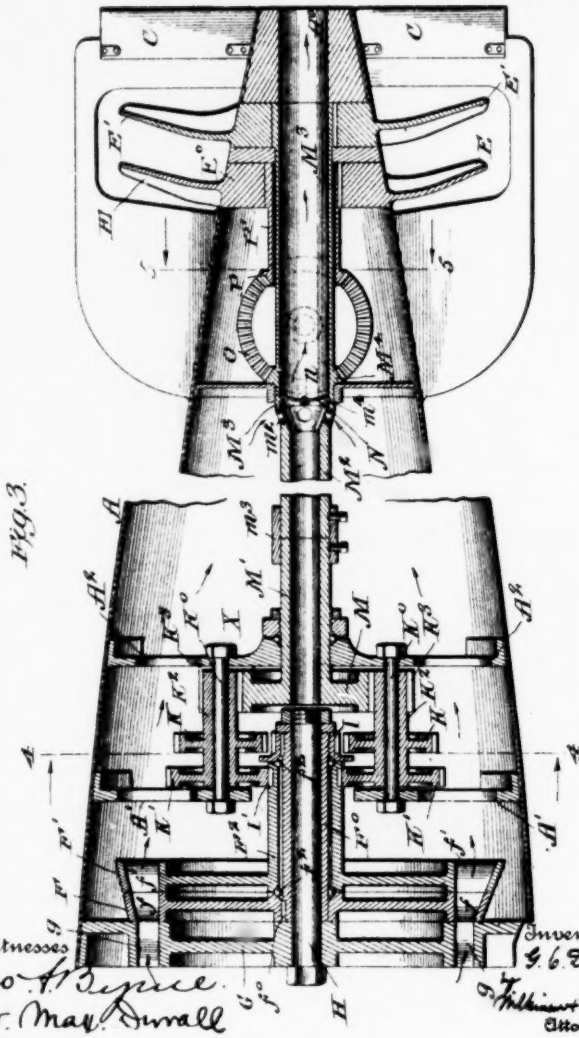


No. 858 266

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G. C. DAVISON.
AUTOMOBILE TORPEDO.
APPLICATION FILED OCT. 10, 1906.

3 SHEETS—SHEET 2.





No. 858,266.

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G. C. DAVISON.
AUTOMOBILE TORPEDO.
APPLICATION FILED OCT. 19, 1906.

3 SHEETS—SHEET 1.

Fig. 4.

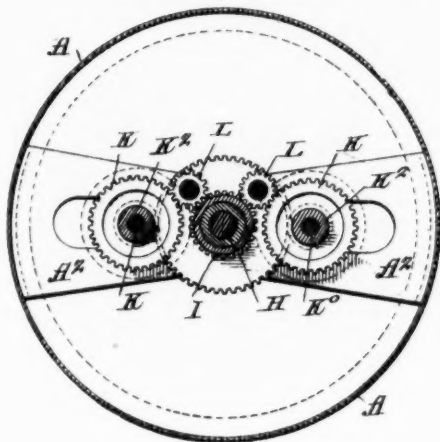


Fig. 5.

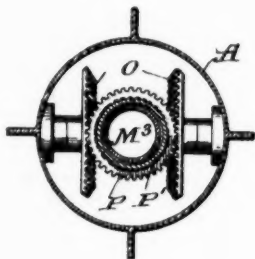
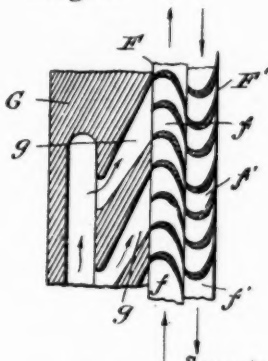


Fig. 6.



Witnesses
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No. 858,266.

PATENTED JUNE 25, 1907.

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AUTOMOBILE TORPEDO.
APPLICATION FILED OCT. 19, 1906.

6 SHEETS--SHEET 4.

Fig. 7.

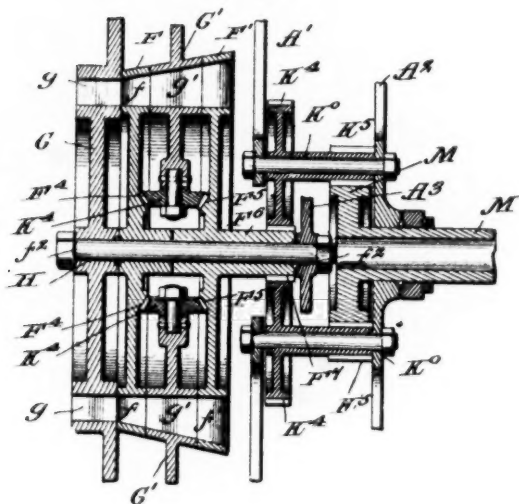
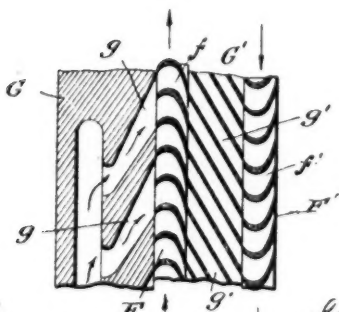


Fig. 8



Witnesses
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No. 858,266.

PATENTED JUNE 25, 1907.

G. C. DAVISON.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 19, 1906.

8 SHEETS—SHEET 6.

Fig 9.

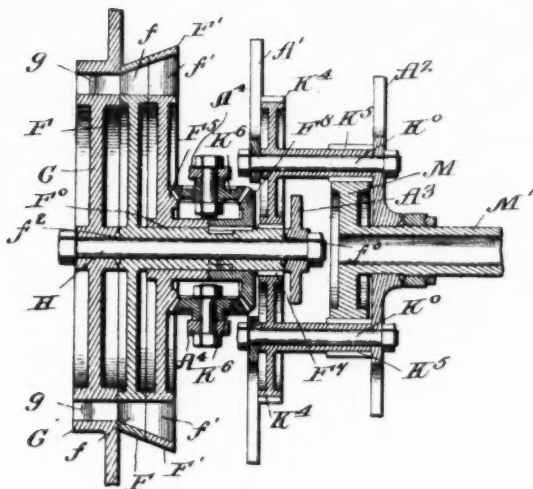
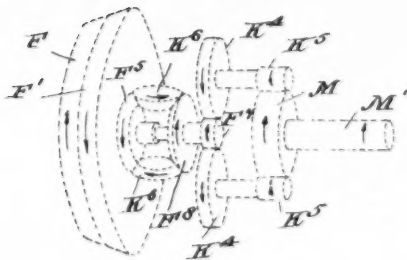


Fig. 10.

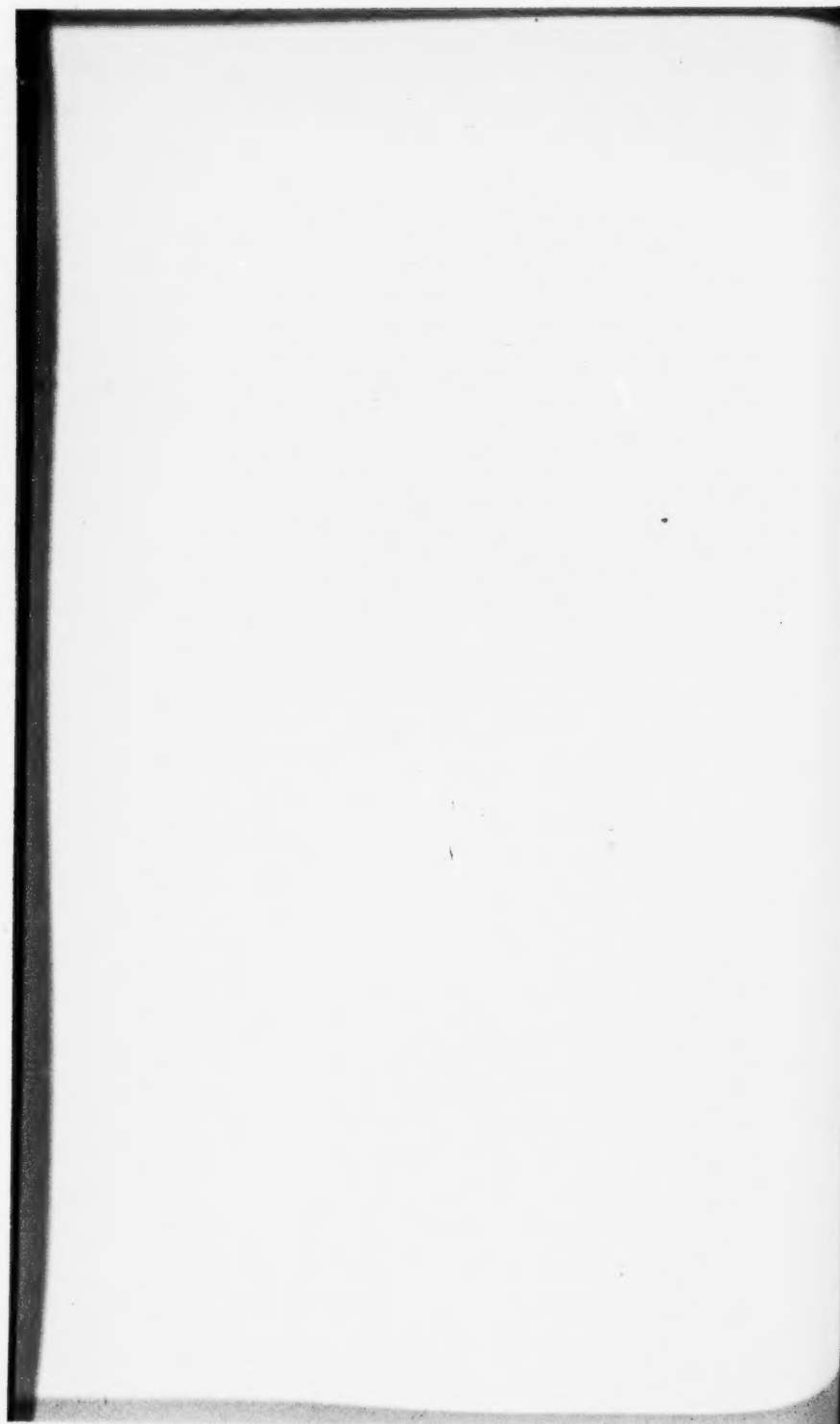


Witnesses

Geo. F. B. B. B.
 W. Max. D. D.

Inventor

G. C. Davison,
 by Millman & Fisher,
 Attorneys



of the device in the simplest form, I prefer one of the arrangements shown in the other figures, preferably, that shown in Figs. 1 to 6, which will now be described. These figures show the preferred form of apparatus, in which the turbines F , F' are provided with expanding vanes f and f' receiving air from nozzles g mounted in the partition plate G . The turbine F is provided with a sleeve F^0 , which, for convenience of manufacture, is splined to the turbine wheel as at f^0 , but which may be made integral with said turbine wheel if desired. This sleeve F^0 rotates on the fixed shaft H and carries a pinion I . The other turbine wheel F' has a sleeve F^2 , which rotates on the inner sleeve F^0 , being separated therefrom by ball bearings f' . This outer sleeve F^2 carries a pinion I' , which meshes in the pinions K' on the two shaft K^0 . These pinions K' are each integral with or secured to a sleeve K^2 , which sleeve carries a pinion K . This pinion K meshes with an idler L , see Fig. 4, which in turn meshes with the pinion I fast to the sleeve F^0 . Each of the sleeves K^2 also carries a pinion K^3 , which meshes with the spur wheel M fast on the hollow shaft M' , which is connected in any suitable way, as by the coupling m^3 to the hollow shaft M^2 . This shaft is expanded to form the hollow propeller shaft M^3 , and this hollow shaft is provided with escape passages m^2 for the air escaping from the turbines, and with a valve seat m^4 for the tail valve N , which is secured to a support n . I do not claim any specific construction of tail valve, as this is well known in the art. In rear of the hollow propeller shaft M^3 there is an opening in the tail of the torpedo, as at A^0 . One of the propellers E' is secured to this propeller shaft M^3 , and the other propeller E is mounted on a hollow shaft P' concentric with the shaft M^3 and provided with a bevel gear P , which meshes with the bevel wheels O , which in turn mesh with the bevel pinion M^4 on the shaft M^3 . Thus the rotation of the shaft M' in one direction will cause the shafts M^3 and P' , and the propellers carried thereby, to rotate in reverse directions.

It will be noted that I provide duplicate sets of gear wheels K , K' , and duplicate bevel gears O , etc., so that the rotating parts may be symmetrically disposed on opposite sides of a common axis, and since these wheels rotate in reverse directions their moments of inertia will neutralize each other.

It will be noted that the spur wheel M , shafts M' , M^2 and M^3 , and the propeller E' all rotate in one direction, and there is nothing to counterbalance this but the propeller E and the hollow shaft P' , which rotate in opposite directions, but the moments of inertia of these two groups of parts may be equalized by making the propeller head E^0 or the hollow shaft P' considerably heavier than the structural strength would demand, so that the sum of the moments of inertia may be made zero. The requisite proportion of the parts may be readily determined by either calculation or experiment.

In the form of device shown in Figs. 7 and 8, the two turbine wheels F and F' are separated by a casting G' having nozzles g . This casting is annular in shape, and journaled on the interior thereof are bevel gears K^4 meshing in bevel teeth F^4 and F^5 carried by the wheels F and F' respectively. The wheel F' carries the sleeve

F^3 carrying a pinion F^7 meshing with the gear wheels K^4 on the shafts K^0 . These gear wheels K^4 drive pinions K^5 meshing with the spur wheel M secured to the shaft M' , driving the propellers, as already described with reference to Fig. 3.

In the form of device shown in Figs. 9 and 10, the nozzles and turbine wheels are arranged substantially as shown in Fig. 3, but the sleeve F^0 carries a bevel gear F^6 , which meshes with bevel gears K^6 journaled in bearings A^1 made fast to the shell of the torpedo. These bevel gears K^6 mesh with the bevel teeth F^3 on the turbine wheel F' . The sleeve F^0 also carries a pinion F^7 meshing with the gear wheels K^4 journaled on the fixed shafts K^0 . These gear wheels K^4 drive pinions K^5 meshing with the spur wheel M fast on the shaft M' which drives the propellers, as already described with reference to Fig. 3.

It will be seen that, in all of the modifications illustrated in Figs. 3 to 10, the two turbine wheels rotate in opposite directions and are geared together so that they must rotate at precisely equal speeds. In the same way the other gear wheels, symmetrically disposed on either side of the axis of the propeller shaft, are so geared that pairs of each will revolve at equal speeds, but the two members of each pair in opposite directions. Now by equalizing the weights of pairs of wheels revolving at equal speeds in reverse directions, the sum of the moments of inertia of each pair will become zero. Where, as in the case of the two turbine wheels, one is slightly larger than the other, the weights may be so arranged that the moments of inertia of each shall be the same, and since the two wheels revolve in opposite directions the sum of these moments will become zero. Thus it will be seen that by any of the herein-described arrangements, substantially perfect dynamic stability is secured, and all gyroscopic effect due to the rotation of the parts within the torpedo is entirely obviated.

It will be obvious that various modifications might be made in the herein described apparatus, which could be used without departing from the spirit of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. The method of compensating torpedoes driven by turbines or other forms of rotary engines or rotary devices, against errors in direction occasioned by gyroscopic action of the rotating parts, which consists in so arranging the rotating parts as to cause the moments of inertia in one direction to neutralize the moments of inertia in the opposite direction so that the sum of the moments of inertia of the system shall be zero, substantially as described.

2. The method of compensating torpedoes driven by turbines or other forms of rotary engines or rotary devices, against errors in direction occasioned by gyroscopic action of the rotating parts, which consists in mounting the rotating parts symmetrically in pairs about a common axis, in driving the two members of each pair of parts in reverse directions at equal speeds and in proportioning the weights and dimensions of these parts so that the sum of the moments of inertia in one direction may neutralize the sum of the moments of

inertia in the reverse direction, causing a resultant dynamic stability, substantially as described.

3. In an automobile torpedo, the combination with two driving wheels rotating in opposite directions at equal speeds and having the same moments of inertia, of balanced reduction gearing driven by said wheels in opposite directions and having the sum of the moments of inertia zero, and a pair of propellers driven by said reduction gearing in reverse directions and with equal angular velocity, substantially as described.

4. In a submarine torpedo, the combination with a double staged turbine engine having turbine wheels of equal moments of inertia revolving in opposite directions and at equal angular velocities, of a double system of reduction gearing driven by said wheels, the sum of the moments of inertia of said system being zero, and propellers driven in reverse directions and at equal speeds by said reduction gearing, substantially as described.

5. In an automobile torpedo, the combination with two driving wheels rotating in opposite directions at equal speeds and having the same moments of inertia, of balanced reduction gearing driven by said wheels in opposite directions and having the sum of the moments of inertia zero, and a pair of propellers driven by said reduction gearing in reverse directions and with equal angular velocity, with the weights of the propellers and propeller shafts and other parts driven by said reduction gearing so arranged as to cause the sum of the moments of inertia of the same to become zero, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

GREGORY C. DAVISON.

Witnesses:

A. L. HOUGH,
MARTHA C. BODINE.

769

COMPLAINANT'S EXHIBIT 50.

No. 748,759.

United States Patent Office.

Frank M. Leavitt, of Brooklyn, New York, Assignor to E. W. Bliss Company, of Brooklyn, New York, a Corporation of West Virginia.

Automobile Torpedo.

Patented January 5, 1904.

Specification Forming Part of Letters Patent No. 748,759, Dated January 5, 1904.

Application Filed October 6, 1902. Serial No. 126,067. (No model.)

To all whom it may concern:

Be it known that I, Frank M. Leavitt, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful improvements in Automobile Torpedoes, of which the following is a specification.

This invention relates to means for propelling automobile torpedoes of the type wherein a fluid under pressure is employed to drive an engine or motor, which in turn drives the propeller screw or screws. The well-known Whitehead torpedo is a typical example. In this torpedo compressed air stored in a reservoir, from which it is liberated through the medium of a reducing-valve, is employed to drive a three-cylinder engine, which directly turns the shaft on which one screw is mounted and from which through bevel-gears the other screw is rotated in the contrary direction. The exhaust-air is discharged through the hollow screw-shaft and escapes at the stern or tail of the torpedo. A retarding gear is required to throttle the admission of compressed air to the engine at launching in order to prevent racing of the engine before the torpedo enters the water, this gear being adapted to admit full pressure to the engine after the latter has made a number of turns corresponding to a duration of time sufficient to insure its submergence.

My invention aims to provide a more simple, durable, and efficient driving means which shall be as free as possible from vibration and wherein the propulsive strains are simple and are taken up in the most direct manner. To these ends my invention provides a fluid-pressure turbine as the motor, connecting it by gearing or other simple manner to the screw or screws. Preferably the turbine is arranged to turn on an axis longitudinally of the torpedo and preferably coincident with the longitudinal axis of the torpedo. Preferably, also, it is connected to the screw or screws by gearing, so that the screws

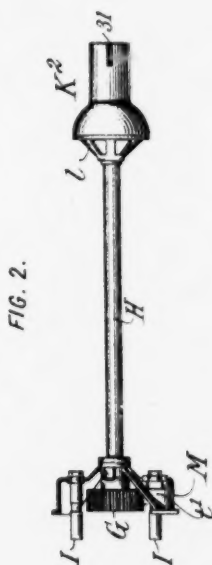
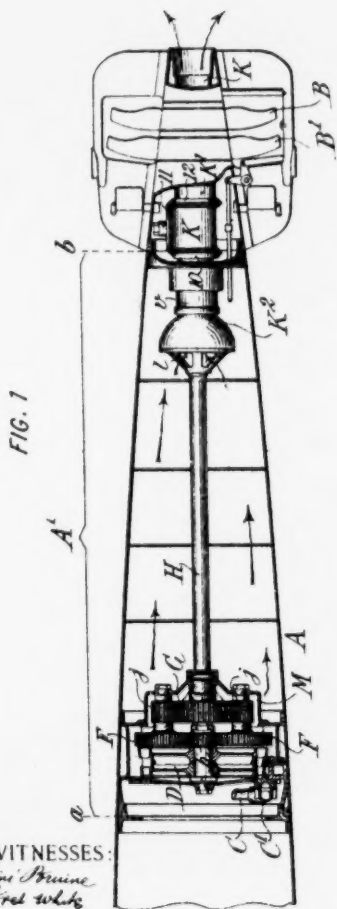
No. 748,759.

PATENTED JAN. 5, 1904.

F. M. LEAVITT.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 6, 1903.

NO MODEL.

6 SHEETS—SHEET 1.



INVENTOR:
Frank M. Leavitt,
 By Attorneys,
Arthur C. Oranger & Co.



F. M. LEAVITT.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 6, 1903.

NO MODEL.

5 SHEETS—SHEET 2.

FIG. 3.

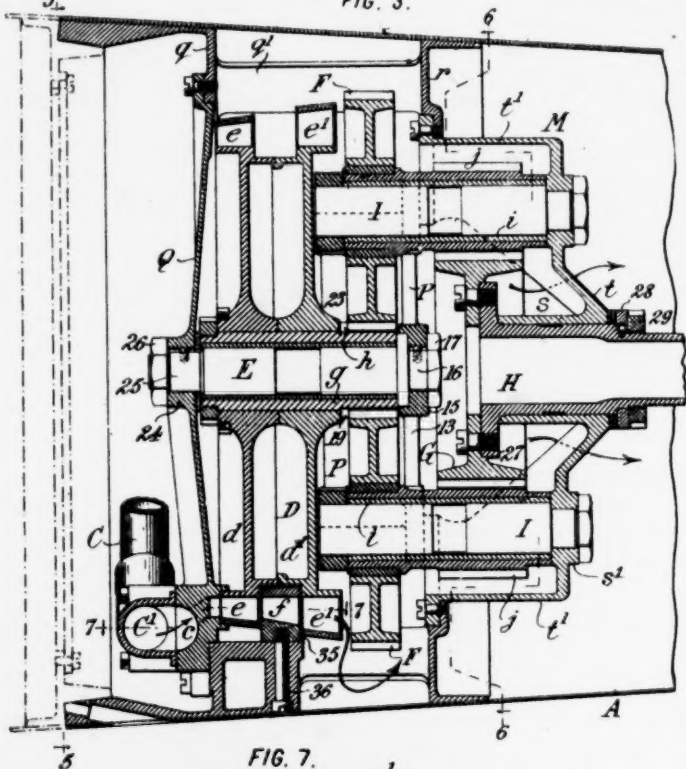
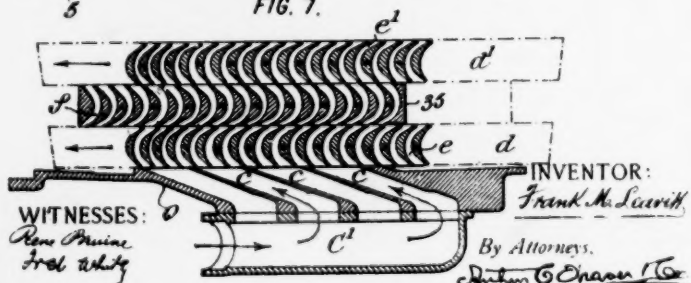


FIG. 7.



WITNESSES:

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Frederick White

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Arthur C. Chase

No. 748,759.

PATENTED JAN. 5, 1904.

F. M. LEAVITT.
AUTOMOBILE TORPEDO.
APPLICATION FILED OCT. 6, 1903.

NO MODEL.

6 SHEETS—SHEET 3.

FIG. 4.

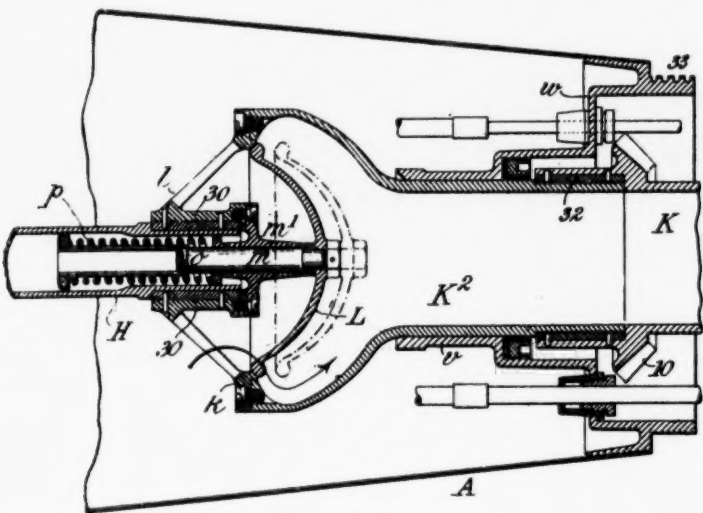
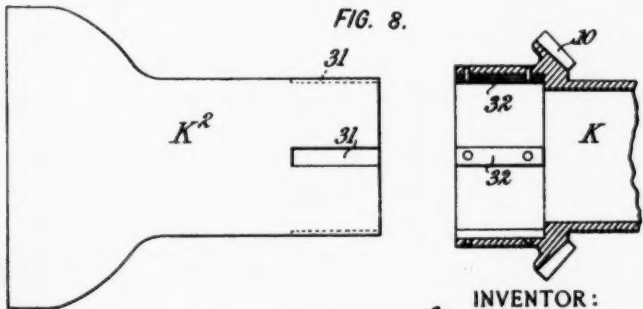


FIG. 8.



WITNESSES:
Rene' Plummer
Ired White

INVENTOR:
Frank M. Leavitt,
By Attorneys,
William C. Draper



No. 748,759.

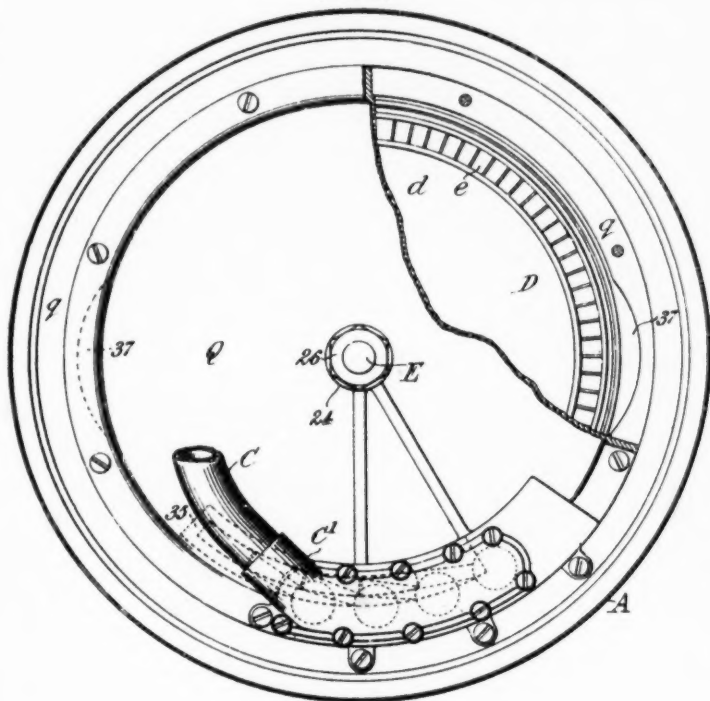
PATENTED JAN. 5, 1904.

F. M. LEAVITT.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 9, 1903.

NO MODEL.

8 SHEETS—SHEET 4.

FIG. 5.



WITNESSES:

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And White

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Arthur C. Chase & Co.

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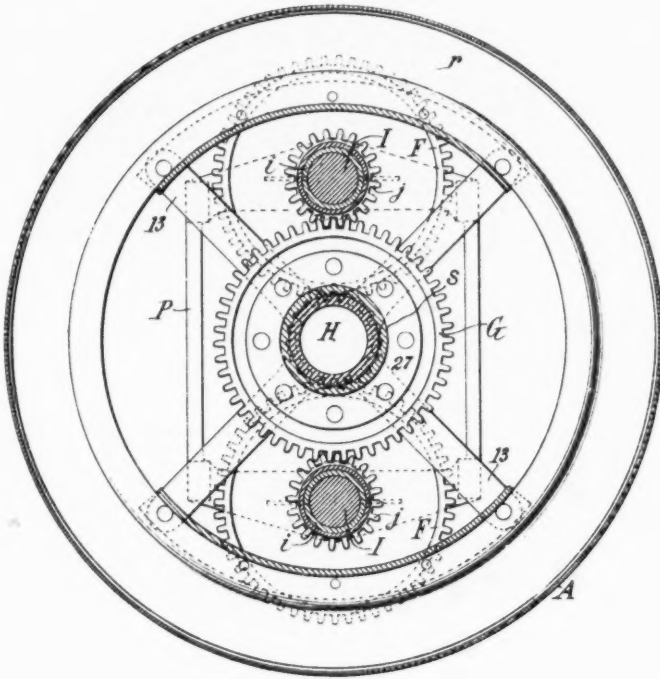
PATENTED JAN. 5, 1904.

F. M. LEAVITT.
AUTOMOBILE TORPEDO.
APPLICATION FILED OCT. 8, 1902.

NO MODEL.

6 SHEETS—SHEET 5.

FIG. 6.



WITNESSES:

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INVENTOR :

Frank M. Leavitt.

By Attorneys,

Arthur C. Oranger & Co.



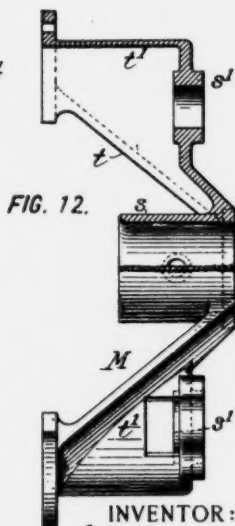
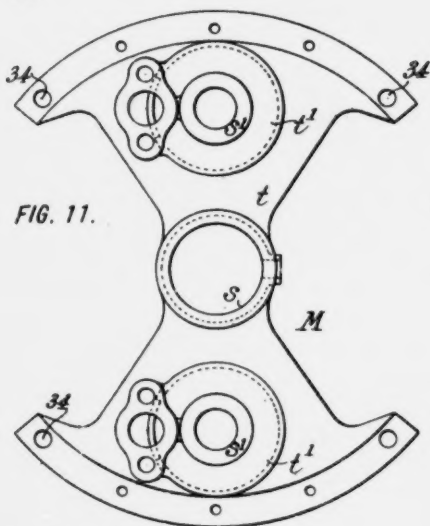
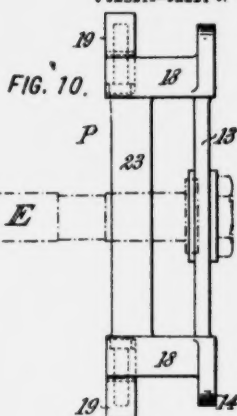
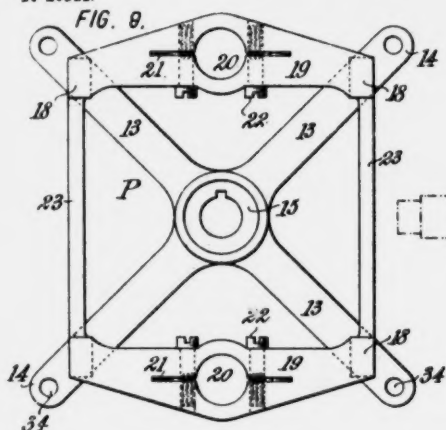
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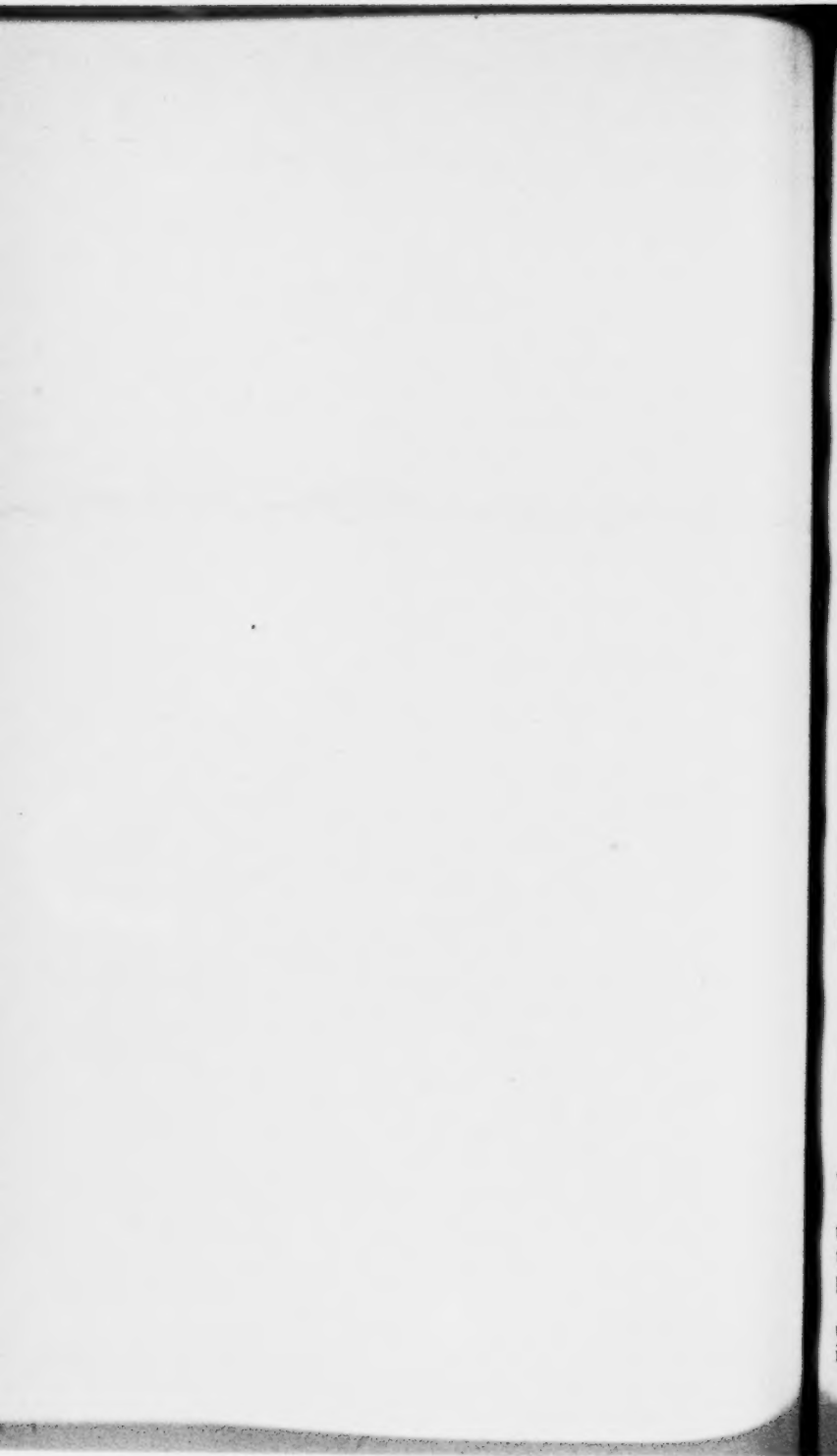
NO MODEL.

6 SHEETS—SHEET 4.



WITNESSES:
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Fred White

INVENTOR:
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 By Attorneys,
Arthur C. Brown & Co.



shall be driven at a lower speed than that of the turbine. To equalize the propulsive strain or torque and enable the turbine to turn with the minimum friction, the transmission therefrom is effected through two or more gears symmetrically arranged around the axis of the turbine and symmetrically engaging the screw-shaft. For driving twin screws it is preferable to drive from the turbine a main shaft carrying or engaging the first screw and from this shaft to drive the second screw through miter-gears, as heretofore.

I will proceed to describe in detail the preferred embodiment of my invention with reference to the accompanying drawings, wherein—

Figure 1 is a longitudinal section of the aft part of a torpedo fitted with my invention, the internal mechanism being mainly shown in elevation. Fig. 2 is an elevation of part of the internal mechanism, including the main screw propelling-shaft and its immediate connections. Fig. 3 is a vertical longitudinal mid-section of the turbine and reducing-gears, being the part shown at the left in Fig. 1. Fig. 4 is a similar section of the parts contained within the rear portion of the after-body. Fig. 5 is a transverse section of the torpedo on the line 5 5 in Fig. 3 looking aft. Fig. 6 is a transverse section on the line 6 6 in Fig. 3 looking forward. Fig. 7 is a section through the turbine-nozzles and buckets cut approximately in the plane of the line 7 7 in Fig. 3. Fig. 8 is an elevation of the coupling or connection between two sections of the propeller-shaft. Figs. 9 and 10 are a front and side elevation of the frame or spider inclosing the gears. Figs. 11 and 12 are respectively a rear elevation and side elevation, partly in section, of another supporting-frame.

Referring to the drawings, let A designate the shell of the torpedo, which may, except in the respects herein described, be understood to be an ordinary Whitehead torpedo. I have not herein shown the main or midship section of the torpedo which contains the air flask or reservoir of compressed air, nor have I shown the starting-lever or pressure-reducing valve, as these parts are all well understood. If desired, reference may be had to my Patent No. 693,872, dated Feb-

(Here follow diagram marked pages 758, 760, 762, 764, 766 & 768.)

ruary 25, 1902, which shows these several parts. The hull
770 or shell of the Whitehead torpedo is constructed in sections, that section which in Fig. 1 extends from the division *a* to the division *b* being known as the "after-body," here lettered *A'*, and that astern of *b*, being known as the "tail," carrying the usual propeller-screws, *B B'*.

Let *C* designate a pipe conveying compressed air or other fluid under pressure by which such fluid is conducted to the inlet *C'*, leading to nozzles *c c*, Fig. 7, of the turbine.

D is the turbine proper, which may be of any ordinary construc-

tion of fluid-pressure turbine, being in this instance shown as constructed of two wheels or disks d d' , the forward wheel, d , having teeth or turbine-buckets e e , receiving the blasts of air from the nozzles c c and discharging the expanding air against fixed buckets f , fastened in the space between the peripheral portions of the disks d d' , as shown in Figs. 3 and 7. From these fixed buckets the expanding air is received by the buckets of the second disk, d' , from which the expanded air is exhausted freely into the cavity or chamber within the shell of the torpedo. The turbine D is fixed on a sleeve or hub g , which turns on a fixed stud E . The hub g is formed with teeth h , constituting a pinion meshing with the teeth of two (or more) gear-wheels F F , arranged on diametrically opposite sides of the axis of the turbine, (or otherwise symmetrically around the pinion h .) The gears F F are fixed, respectively, on sleeves or hubs i i , which turn on fixed studs I I . On the sleeves i i are fixed pinions j j , (preferably by forming their teeth integrally with the sleeves,) and these pinions j j mesh with a gear G , which is fastened on the forward end of a shaft H , which extends aft, preferably in the axial center of the torpedo, and its rear end engages or is coupled to the tubular shaft K , on which is fixed the propeller-screw B . The screw B' is fixed on a tubular shaft K' , surrounding the shaft K , and driven from it in the contrary direction through miter-gears 10, 11, and 12, as in the ordinary Whitehead torpedo.

It is apparent that when the fluid-pressure is admitted through the pipe C to the nozzles c c its impingement upon the turbine-buckets will cause the turbine to rapidly revolve, and through the gearing h F F j j G the shaft H is driven at a slower speed and in turn drives the screw B at its own speed and the screw B' at a like speed in the contrary direction. It is desirable to gear down between the turbine and screws, since for efficiency the turbine should revolve at a higher speed than the highest speed at which the screws can efficiently turn. Preferably the screws are made with a pitch similar to that of those of the Whitehead torpedo, and the speed reduction is sufficient to drive them at a speed which may be approximately the same as that in the Whitehead torpedo or which may be increased within certain limits, a speed of twelve hundred to fourteen hundred revolutions being probably the maximum that is desirable. The proportions of gearing shown in the drawings are such that the screws make one turn to about five turns of the turbine, this being considered the preferable proportion, although it may be considerably departed from.

Instead of providing the turbine with its own casing, as is customary in the construction of steam-turbines, I utilize in part the torpedo-shell for inclosing the turbine and discharge the exhaust directly into this shell. The course of the exhaust is shown by arrows in Figs. 3 and 4 and in Fig. 1. The exhaust-air is finally discharged from the torpedo through the hollow shaft K in order that it may be discharged at the stern and aft of the screws, as in the Whitehead torpedo. It is within my invention in its broadest aspects to discharge the air otherwise; but this mode is preferable. In order to prevent the return flow of water through the shaft K at the end of the run, which would reduce the buoyancy of the torpedo, I pro-

vide a check-valve which opens to permit the exhaust to escape and is thereupon closed by a spring, so that it prevents the ingress of water. This valve is preferably constructed and located as shown in Fig. 4, where it closes the entrance to the enlarged or trumpet-shaped end of a pipe or hollow shaft K^2 , which forms a forward exhaust. Fig. 4, where it closes the entrance to the enlarged or trumpet-mouth against a ring or flange k therein, which is united by a spider or cone l to the rear end of the shaft H . The valve L is mounted on a stem m , which slides freely in a sleeve m' , fixed on the hub of the spider l , and this stem is acted on by a spring p , which is conveniently coiled around it and confined between a head or nut on the forward end of the stem and the shoulder formed by the front face of the sleeve m' . When the exhaust discharged into the torpedo-shell acquires sufficient pressure to overcome the light spring p , it forces open the valve L to the position shown in dotted lines in Fig. 4, in which position the valve is arrested by a stop-shoulder o on the stem m striking the sleeve m' . The air then flows past the valve, as indicated by the arrow in Fig. 4. At the end of the run, or when the air ceases to exhaust through the turbine and its pressure falls, the valve is closed by the spring p , so that water entering the hollow shaft K cannot flow into the air-space within the hull.

Some preferable details of construction will now be described.

In order to provide a strong but light mounting for the turbine and gears, the torpedo-shell A is provided with internal stiffening-rings q and r , which are preferably tied together at intervals by tie-bars q' . The ring r is flanged at its inner periphery to receive a flange on a bearing shell or bracket M , preferably constructed in the manner shown in Figs. 11 and 12. This shell M has a central
 771 hub or sleeve s , which forms a bearing for the rear end of the shaft H . (See Fig. 3.) It also has hubs or bosses $s' s'$, to which are fastened the studs $I I$, which project thence forwardly, as shown in Fig. 2. The central hub s and outer bosses $s' s'$ are connected by a web or shell t , which is conical except at $t' t'$, where it is made cylindrical to inclose the pinions $j j$. The conical web t is cut away at opposite sides to afford ample passage for the outflow of air from the turbine. For supporting the front ends of the studs $I I$ and the rear end of the stud E , I provide a frame P , which is shown separately in Figs. 9 and 10. This frame is preferably constructed with cross-arms $13 13$ at the rear, connecting ears $14 14$, which are fastened by screws to the ring r , with a central hub 15 , to which is fastened the rear end of the stud E , the latter having a contracted neck 16 , which passes through the hub 15 and is screw-threaded to receive a nut 17 , by which the stud is clamped in place, being prevented from turning by a pin or key set in the neck 16 and entering a notch or keyway in the hub. The stud E is shown in place in dotted lines in Fig. 10. Projecting forwardly from the four arms 13 are four posts or bars $18 18$, the two upper bars being connected at their front ends by a yoke 19 and the two lower bars being connected by a like yoke 19 . The yokes 19 are formed with holes 20 for receiving the front ends of the studs $I I$. The yokes are also split at 21 and provided with tightening-screws 22 , whereby their split portions may

be drawn together to tightly clamp the studs I I. To securely connect the yokes and prevent the studs I I being forced apart by the thrust transmitted through the gears, the opposite ends of these yokes are connected by vertical tie-bars 23, which prevent the gears from spreading or getting out of mesh. The front end of the stud E is supported by a disk or head Q, the outer flange of which is fastened by screws to the ring *q*, its center being formed with a hub 24, which receives a neck 25 on the stud E, the latter being tightly connected by a nut 26, screwing on its threaded end. The disk Q serves as an air-tight partition, separating the engine-chamber in its rear from the chamber in front of it. The nozzles *c c* are shown as formed integrally with the disk or plate Q, although this is not necessary. The shaft H is formed at its front end with a flange 27, to which the web of gear-wheel G is fastened by screws. A separable collar 28 is fastened on the shaft to engage the rear of the bearing-sleeve *s*, being held in place by a screw ring or nut 29. The rear end of the shaft H is connected to the spider *l* by means of keyways formed in the shaft and keys 30 riveted in place within the hub of *l*, so that the shaft H may be slid into or out of engagement with the spider *l*. The ring *k* of this spider is fastened by screws to the flared end of the tubular shaft K². This latter is connected to the tubular shaft K by similar keyways and keys, as shown in Fig. 8, where 31 31 are keyways in the shaft-section K² and 32 32 are keys riveted into grooves in the shaft-section K, so that the shaft-sections can be engaged or disengaged by a longitudinally-sliding movement. The tubular shaft K has bearings as heretofore in the tail of the torpedo, while to support the shaft-section K², and through it the rear end of the shaft H, a sleeve *v*, Fig. 4, is formed as a forward projection from the usual ring or partition piece *w*, which latter has mutilated screw-threads 33 for uniting the tail.

The several parts thus described are especially designed and adapted for convenient assembling and insertion within the confined space afforded by the torpedo-hull. The operations of assembling are as follows: The shaft H, having fastened upon it the gear G, is passed rearwardly through the hub *s* of the frame M and its collar 28 and screw-ring 29 are applied. The studs I I are fastened in place in the hubs *s'* of the frame M. The valve L, spider *l*, stem *m*, spring *p*, and sleeve *m'* are united in obvious manner, and the seating-ring *k* is then fastened by screws to the shaft-section K², whereupon the rear end of the shaft H is entered into the hub of the spider *l*, so that the shaft H and connected parts appear as in Fig. 2. The stud E being then fastened to the frame P, Fig. 10, the gears F, with their sleeves *i* and pinions *j*, are entered loosely into approximately their correct positions in this frame, and the frame is then applied to the frame M, in so doing sliding the sleeves *i* onto the studs I, with the pinions *j* in mesh with the gear G. The yokes 19 are then engaged with the ends of the studs I I and their clamping-screws 22 tightened. This temporarily unites the frames P and M and the other parts named. These several parts thus united are then entered into the after-body A' (which at this time is disconnected from the other sections of the torpedo-hull) by inserting them through the rings *q*

and r and guiding the end of the shaft-section K^2 into the bearing-sleeve e . As the gears $F F$ project beyond the normal opening in the ring q , this opening is enlarged at 37 37, Fig. 5, on opposite sides, so that by turning the interior parts to bring the gears $F F$ into coincidence with the arc-shaped notches 37 the parts can be entered, after which the parts are turned to bring them to their final position. On bringing the frame M into its proper place against the ring r screws are inserted through its flange into this ring, four screws being inserted through the coinciding holes 34 34, Figs. 9 and 11, in the frames $P M$, whereby the several parts are fastened securely in place. The block 35, in which are formed the stationary buckets f , is then placed between the buckets $e e'$ of the turbine D , (the parts of this turbine having been previously united on their sleeve q .)

772 The turbine is passed within the ring q and onto the stud E , whereupon the block 35 is guided into the correct position and fastened in place by screws 36, one of which is shown in Fig. 3. In putting the turbine in place the pinion h enters into mesh with the gears $F F$. The disk or head Q is then put in place and fastened by screws through its peripheral flange and by screwing on the central nut 26. Finally, the air-inlet C' , previously united to the air-inlet pipe C , is fastened by screws to the disk Q .

My turbine-motor mechanism for automobile torpedoes has important practical advantages over the fluid-expansion engines heretofore used, being much simpler, having about ten per cent. greater efficiency, being free from vibration and noise except only the slight noise inseparable from the use of gearing, having no dead-center, being subject to no severe shocks or strains, and being of far superior durability. This latter feature is of great practical importance, it being well known that in the Whitehead torpedo the engine has to be rebuilt usually after forty shots or practice runs and even after about twenty runs requiring ordinarily to be refitted by the rebushing of bearings and readjustment of parts. My turbine-motor being free from shocks or violent strains by taking up within its own framework the direct strains to which it is alone subject will continue in perfect condition for considerably over one hundred shots or runs and, in fact, until its wearing surfaces or bearings are so worn down as to require renewal. Another important advantage of my motor is that it requires no retarding-gear to prevent racing of the screws during launching, since the turbine speeds up so gradually that it does not reach full speed until about the time the torpedo enters the water, so that no racing can occur.

What I claim is—

1. A torpedo comprising a compressed-air reservoir, a reducing-valve, a turbine-motor, and a screw, with an outflow-conduit from said reservoir through said valve to the inlet-nozzle of said turbine, and means for communicating rotation from said turbine to said screw.

2. A torpedo comprising a compressed air-reservoir, a reducing-valve, a turbine-motor, and axial twin screws arranged tandem, with an outflow-conduit from said reservoir through said valve to the inlet-

nozzle of said turbine, and reducing-gearing interposed between said turbine and screws for driving the screws in opposite directions.

3. A fluid-pressure-propelled torpedo having a turbine-motor for driving its screw, and interposed gearing symmetrically arranged to equalize the thrust or torque imparted by the turbine.

4. A fluid-pressure-propelled torpedo having a turbine-motor turning on an axis longitudinally of the torpedo, and reducing-gears turning on axes parallel therewith and arranged symmetrically for communicating its rotation to the screw-shaft.

5. A fluid-pressure-propelled torpedo having a turbine-motor turning on an axis longitudinally of the torpedo, a pinion fixed to said turbine, reducing gears meshing therewith and turning on axes parallel to said axis and having pinions fixed to them, an axial screw-shaft, and a gear-wheel thereon meshing with said pinions, said reducing-gears being disposed symmetrically around the central axis.

6. A fluid-pressure-propelled torpedo having a turbine-motor for driving its screw, and bearing-frames for the turbine and screwshaft adapted to be entered within the torpedo shell and to be fastened to strengthening-rings therein.

7. A fluid-pressure-propelled torpedo having a turbine-motor turning on an axis longitudinally of the torpedo and connected to drive its screw, a central screwshaft, a bearing for the after end thereof, a bearing frame or bracket for the forward end thereof, studs carried by said frame, and reducing-gears turning on said studs for communicating the rotation of the turbine to said shaft, whereby said gear, shaft and frame may be simultaneously entered into the torpedo-shell.

8. In a torpedo having a turbine-motor and a central screw-shaft, a frame carrying parallel studs, reducing-gears and pinions turning on said studs, a central stud connected at one end to said frame on which turns the turbine, and a disk supporting the other end of said stud and fastened within the torpedo-shell.

9. In a torpedo having a turbine-motor and a central screw-shaft, a frame M having a central bearing for said screw-shaft, studs I I supported by said frame, a second frame supporting the opposite ends of said studs, and reducing-gears turning on said studs.

10. In a torpedo having a turbine-motor and a central screw-shaft, a frame M having a central bearing for said screw-shaft, studs I I supported by said frame, a second frame P, a central stud E carried by said frame, reducing-gears turning on the studs I I, and a turbine turning on the stud E.

11. In a torpedo having a turbine-motor and a central screw-shaft, studs I I, reducing-gears turning thereon, and a frame P having yokes engaging said studs and having ties uniting said yokes.

12. In a torpedo having a turbine-motor and a central screw-shaft studs I I, reducing-gears turning thereon, a central stud E on which the turbine turns, and a frame P having a central hub for supporting said stud E and yokes for supporting said studs I I.

13. In a torpedo having a turbine-motor, studs I I, reducing-gears turning thereon, and a frame connecting said studs having yokes

engaging the studs and means for clamping said yokes to the studs.

773 & 774 14. In a torpedo having a turbine-motor and a central screw-shaft, the combination of the torpedo-shell A, rings *r q* therein, frame M fitting into said ring *r* and forming a bearing for the screw-shaft, and disk Q fitting into said ring *q* and supporting a stud on which the turbine turns.

15. In a torpedo having a turbine-motor, the combination of the shell A, a ring *q* therein, a disk Q fastened to said ring *q*, means for supporting the turbine aft of said disk, and means for admitting fluid-pressure through said disk to drive the turbine.

16. In a torpedo having a turbine-motor, the combination of the torpedo-shell A, a partition dividing it, the turbine located aft of said partition, and means for supporting the turbine whereby the torpedo-shell aft of said partition serves as a chamber for the turbine, the turbine being arranged to exhaust into said chamber.

17. A torpedo having a turbine-motor exhausting into the hollow hull of the torpedo, and a discharge-passage for conveying the exhaust therefrom to the tail of the torpedo.

18. A torpedo having a turbine-motor, and a self-closing valve through which the exhaust from the turbine escapes from the torpedo adapted to prevent entrance of water into the torpedo.

19. A torpedo having a turbine-motor exhausting into the hollow hull of the torpedo, a discharge-passage for conveying the exhaust therefrom through the tail of the torpedo, and a self-closing valve in said passage.

20. A torpedo having a turbine-motor and a central tubular screw-shaft, the latter arranged to serve as a discharge-passage for the exhaust from the turbine, and a self-closing valve mounted within said shaft.

21. A torpedo having a turbine-motor and a central screw-shaft, the aft portion of said shaft being tubular and having a trumpet-mouth, openings for admitting exhaust fluid from within the torpedo-hull into said trumpet-mouth to flow through said hollow shaft and escape at the torpedo-tail, and a self-closing valve in said trumpet-mouth for preventing ingress of water.

22. A torpedo having a turbinemotor and a central screw-shaft, the latter formed with a tubular section K mounted in the tail-section of the torpedo, a tubular section K² mounted in the after-body, and a main shaft H engaging said section K² and having a bearing in the after-body, and driven at its forward end by the turbine.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

ARTHUR C. FRASER,
FRED WHITE.

783

DEFENDANT'S EXHIBIT 104.

United States Patent Office.

Charles G. Curtis, of New York, N. Y., Assignor to the Curtis Company, of Same Place.

Elastic-Fluid Turbine.

Specification Forming Part of Letters Patent No. 566,968, Dated September 1, 1896.

Application Filed January 13, 1896. Serial No. 575,244.
(No Model.)

To all whom it may concern :

Be it known that I, Charles G. Curtis, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in Elastic-Fluid Turbines, of which the following is a specification.

The object I have in view is to convert the energy of steam or other elastic fluid under pressure into mechanical power by utilizing its *vis viva* or velocity in a turbine in such a manner as to secure not only a higher efficiency, but also a much lower speed of revolution than has been obtained from any turbine heretofore, as well as increased simplicity of the apparatus.

In carrying out my invention I construct my turbine so as to first secure the highest velocity attainable in the fluid consistent with obtaining the most economical result. This I do by passing the elastic fluid through an expansion-nozzle, which converts all the pressure into *vis viva* except what may be required to cause the flow of the fluid in the most efficient manner through the vane-passages, and I abstract this *vis viva* fractionally and convert it into mechanical rotation by directing the fluid two or more times in succession against the moving vanes of the turbine, which vanes have only a fraction of the initial speed of the fluid. In this way, and if the conditions which will be hereinafter described are provided, the *vis viva* is substantially all utilized and a moderate speed of the turbine is obtained. The turbine is also one of marked simplicity compared with compound turbines heretofore employed in practical work. It has been heretofore attempted to convert the entire pressure of the steam into velocity by means of an expansion-nozzle and to utilize the high velocity thus obtained upon one set of rotating vanes. This attempt has only met with partial success for various reasons. Unless the boiler-pressure is exceedingly low the *vis viva* of the steam when fully developed involves so high a velocity that, in order to utilize it most efficiently, the speed of a single set of vanes would have to be so great as to disrupt the apparatus by centrifugal force. Consequently a lower speed than that giving the highest efficiency has been employed, and a reducing-

gear has even then been necessary to bring the speed down to the point where it becomes commercially available. With my compound turbine, however, the speed of the vanes need not approach the maximum velocity of the fluid-jet in order to secure high efficiency, because the velocity which remains in the fluid-jet after leaving the first set of vanes is utilized in one or more succeeding sets of vanes. The energy extracted from the fluid and converted into mechanical rotation by each set of vanes is the difference between the *vis viva* admitted to and the *vis viva* flowing out of the vane-passages, and, other things being equal, may be roughly expressed with reference to each set of vanes as the difference between the squares of the velocities at entrance and at issue. For this reason the energy extracted by a set of vanes is increased without increasing the speed of their rotation by increasing the velocity of the fluid at the point of admission to the vane-passage. It will therefore be seen that by obtaining the maximum available velocity of the fluid-jet before delivering it to the first set of vanes a greater percentage of the total energy will be abstracted in the first set of vanes and the number of subsequent sets of vanes required to abstract the remaining energy will be lessened, thus greatly simplifying the apparatus.

In order to secure the most efficient results, other conditions in the construction and operation of the turbine should be provided for. These will now be referred to.

The velocity or *vis viva* of the fluid-jet being abstracted fractionally by the two or more sets of rotating vanes, it follows that the velocity of the fluid-jet will be reduced by each passage through the rotating vanes. To accommodate the flow of the fluid-jet at the reduced velocities, so that its flow will not be impeded and no choking will occur, the working passage through the turbine must be enlarged in the direction of flow directly as the velocity is decreased. It is not necessary for this purpose that the passage through any set of the movable vanes should be expanded between the receiving and discharging ends of the passage, since the speed of the jet through a movable passage relative to the walls of the passage is maintained, though the actual velocity of the jet is reduced by the movement of the passage; but in discharging into a stationary passage a larger cross-sectional area should be provided, and this cross-sectional area should be maintained throughout the length of the stationary passage, so that the fluid-jet in being presented to the second set of movable vanes shall occupy a cross-section which is as many times greater than the cross-section of the delivery end of the nozzle as the velocity is times less. It also follows that the second set of movable vanes must afford this additional cross-section. The retardation of the fluid-jet by surface friction and a similar effect produced by eddy currents, which tend to reconvert the velocity into pressure, are also important factors in the construction of my turbine. Both of these actions are referred to hereinafter as "frictional retardation." Unless the former of these actions is compensated for and the latter is prevented a considerable loss in efficiency will occur in the operation of the turbine. To provide against this I maintain a difference in pressure between

the delivery end of the nozzle and the exhaust, which pressure is converted into velocity in the working passage of the turbine by a further expansion of that passage in the direction of flow beyond that required to take care of the reduced velocity of the fluid-jet due to the mechanical action of the moving vanes. This expansion or enlargement of the working passage is preferably made throughout the length of the passage in both its movable and stationary portions, so as to produce a gradual expansion and hence a constant draft or pull upon the fluid-jet in the direction of the exhaust. The amount of initial pressure in the jet that is necessary to overcome this frictional retardation is best ascertained empirically, depending as it does upon the shape and size of the passage and the character of the surface exposed to the fluid-jet. Free flow through the passage without choking and with the highest attainable velocity at the entrance to each movable part is the desideratum in practice. With reference to all conditions, the passages through which the fluid flows are enlarged in proportion to the decrease of the fluid's velocity, whether caused by the velocity-extracting vanes or by the retardation of flow caused by frictional consumption of energy or by the redevelopment of heterogeneous vibration in the fluid. I prefer to convert into *vis viva* before the fluid is delivered to the first set of vanes all the energy contained in the fluid, except the amount which will compensate for the frictional loss and to counteract the tendency of the *vis viva* to be reconverted into pressure. I prefer to construct the expanding-nozzle so as to convert all the pressure into velocity, except sufficient pressure to maintain the flow of the fluid-jet in the most efficient manner; but a higher pressure than this may be employed at the entrance to the working passage of the turbine, in which case the discharging end of the delivery-nozzle will not be enlarged relatively to so great an extent, and a portion of the useful or available pressure will be converted into velocity after the delivery of the fluid-jet to the first set of vanes and while it is passing through the working passage of the apparatus, and the working passage beyond the delivery-nozzle will be expanded with reference to the conversion of this additional pressure into *vis viva* beyond the increased cross-section required to compensate for the decreased velocity produced by the movable vanes and beyond that required by frictional retardation. I prefer to construct the working passage of my compound turbine, *i. e.*, the passages beyond the delivery-nozzle, with two or more complete circular ranges of curved vanes, mounted upon one or more drums, wheels, or disks, the succeeding sets of vanes being connected by stationary passages, which are likewise curved and change the direction of flow of the jet, so as to deliver it to the succeeding sets of vanes at the same angle as it is delivered to the first set of vanes by the delivery-nozzle; but a single set of rotating vanes may be employed and the intermediate stationary passages may serve to deliver the jet successively to different portions of the vanes of this single set, as will be understood, or the passages beyond the delivery-nozzle may be composed entirely of movable vanes mounted upon oppositely-rotating bodies. The mov-

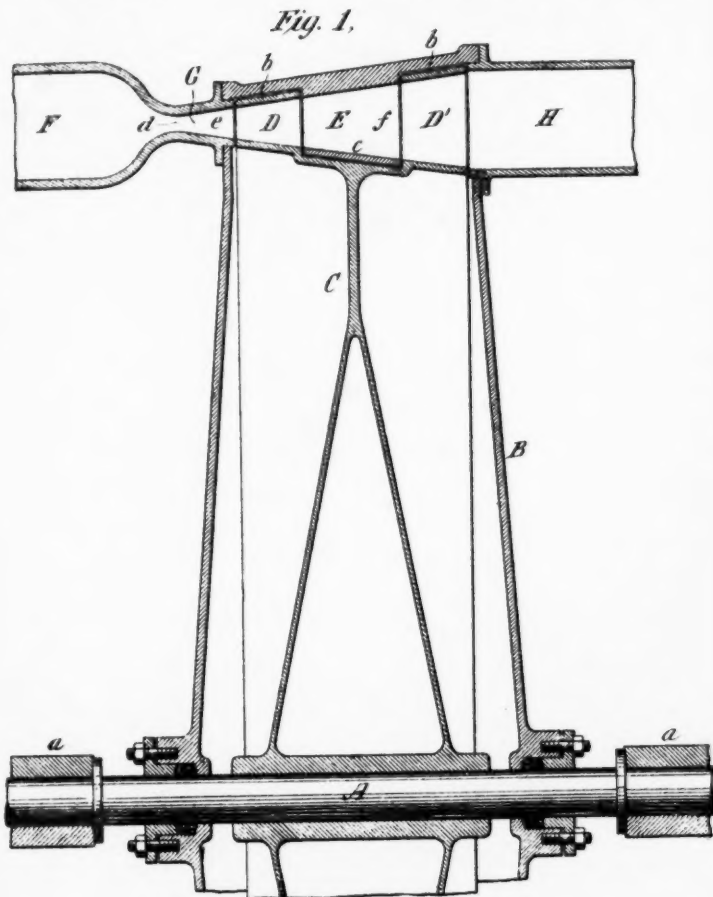
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C. G. CURTIS.
ELASTIC FLUID TURBINE.

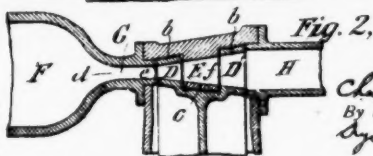
No. 566,968.

Patented Sept. 1, 1896



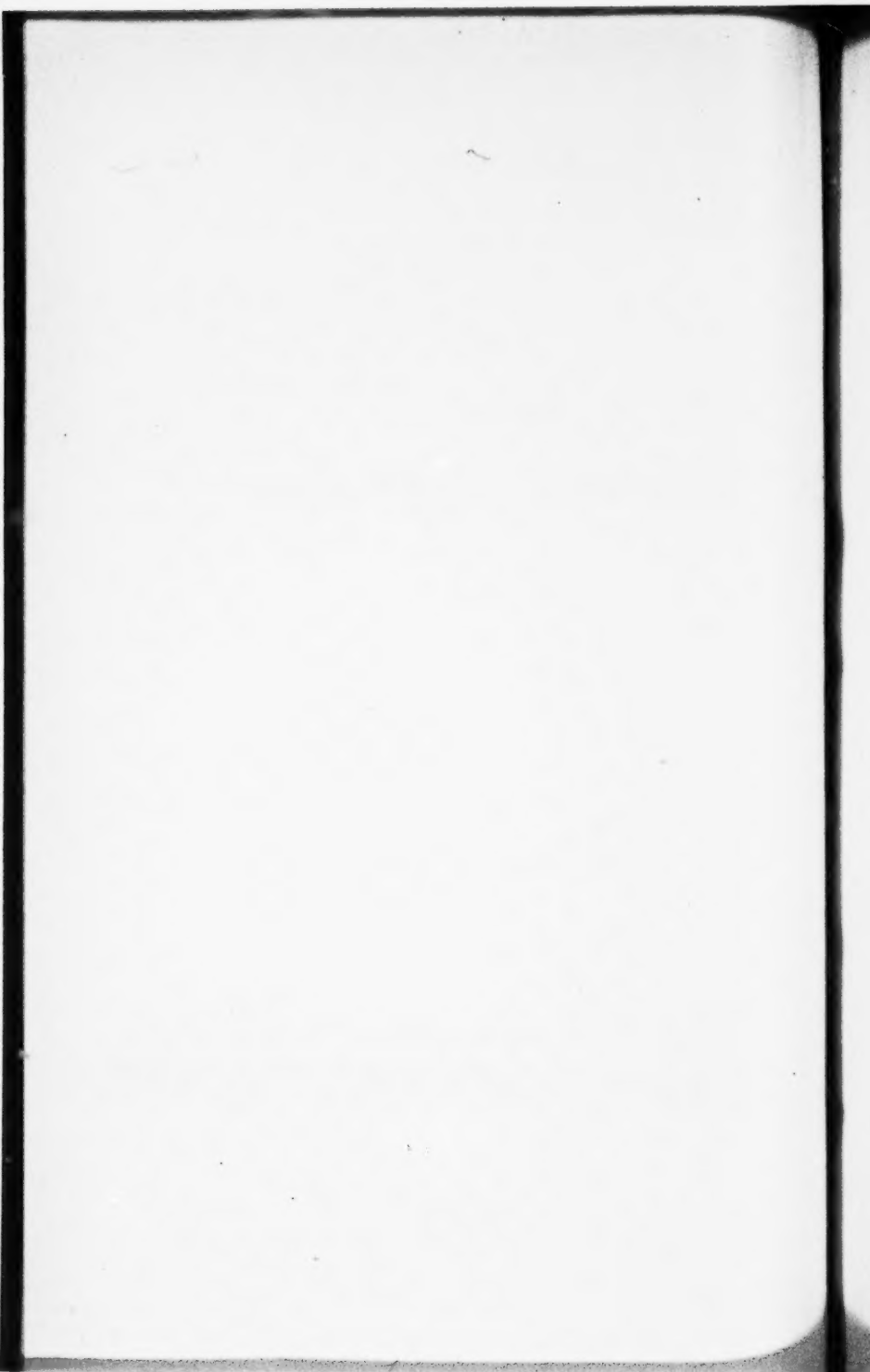
WITNESSES:

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INVENTOR:

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(No Model.)

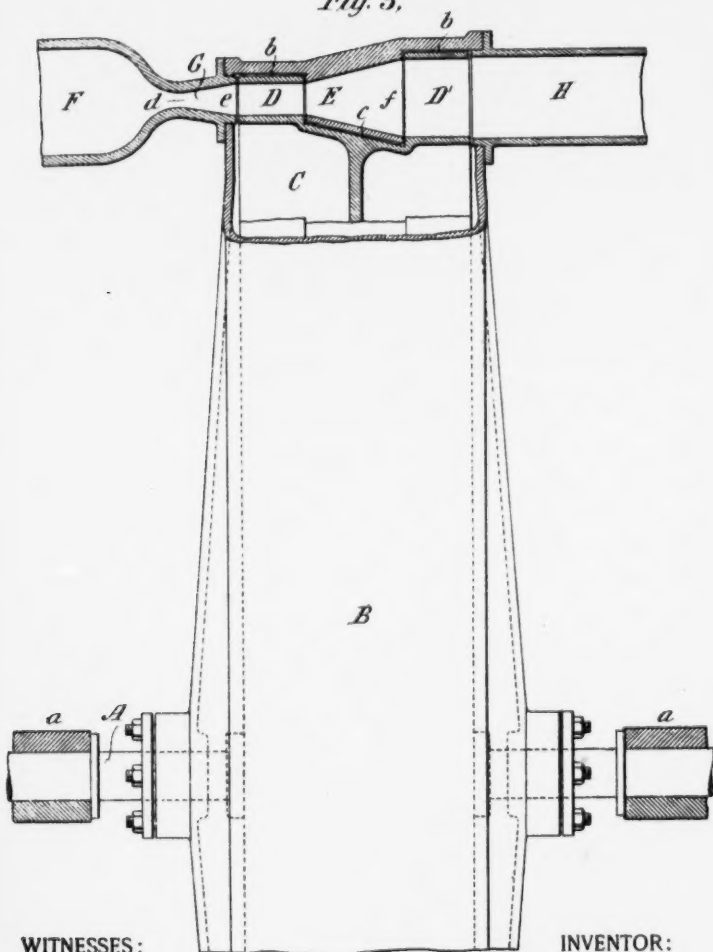
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C. G. CURTIS.
ELASTIC FLUID TURBINE.

No. 566,960.

Patented Sept. 1, 1896.

Fig. 3.



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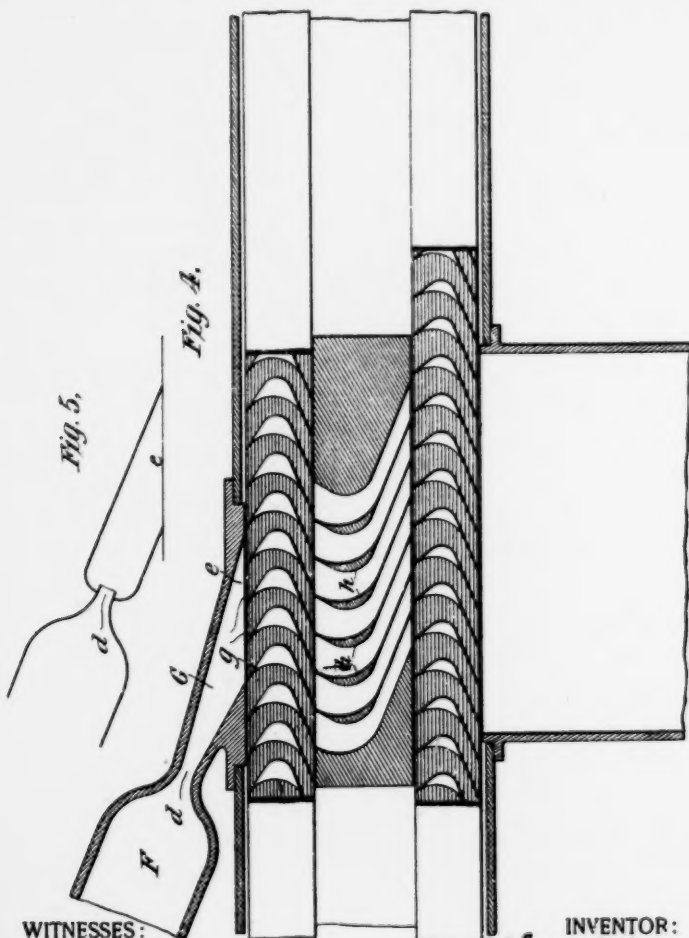
(No Model.)

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C. G. CURTIS.
ELASTIC FLUID TURBINE.

No. 566,968.

Patented Sept. 1, 1896.



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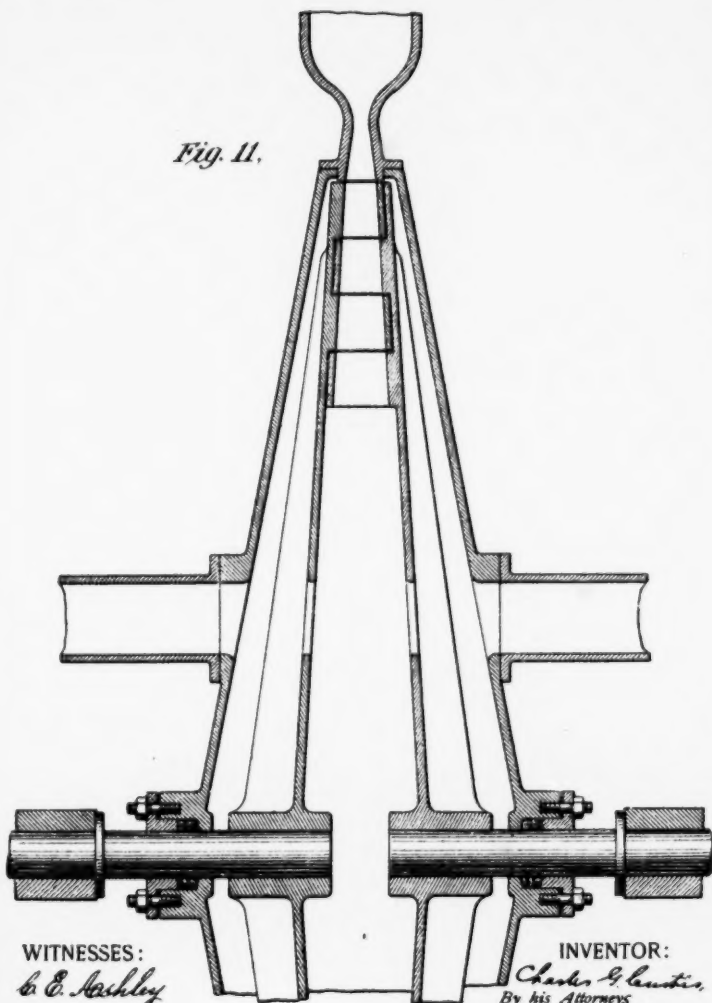
(No Model.)

9 Sheets—Sheet 9.

C. G. CURTIS.
ELASTIC FLUID TURBINE.

No. 566,968.

Patented Sept. 1, 1896.

Fig. 11.

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ble vanes are preferably constructed on a curve from their receiving ends to a point beyond their centers, from which point they extend at a lesser angle to their discharging ends in order to obtain as much reactive effect as possible. This form of vane also permits the fluid-jet, which is somewhat compressed by the impact against the curved faces of the vanes, to expand to its normal volume in passing along the extended discharging ends of the vanes and before reaching the points of clearance at the discharging ends of the vanes. The vanes are also preferably given a progressively greater angle at their receiving ends in successive sets of vanes to compensate for the decreased velocity of the jet relative to the speed of the vanes. The intermediate stationary passages which are employed in the preferred form of my apparatus are wide enough to receive the jet from all the vanes from which it is discharged, including those into which the jet may "spill" at the preceding point of delivery, and where the stationary passages are single or undivided they are preferably spread out sidewise at their receiving ends in the direction of the movement of the vanes to collect the divided portions of the fluid-jet, and these sides converge toward the center of the passage, so as to reduce the jet to its normal volume. The successive passages are likewise set progressively farther forward at their forward sides, so as to compensate for the additional "lead" in the discharge from the movable vanes produced by the increased ratio of the speed of the vanes to that of the jet. I prefer, however, to make the stationary passages wide enough for all purposes, and to divide them into a number of parts by means of vanes which have a shape similar to the movable vanes. In this way eddy-currents, due to a wide passage, are prevented, the fluid-jet occupying only such parts of the divided stationary passages as it may be delivered to by the preceding set of movable vanes. In the case of the divided stationary passages the succeeding passages may be made progressively of additional width.

It is the design of my turbine to employ at the delivery end of the nozzle and in the working passage a "jet" of steam or other elastic fluid, *i. e.*, a solid stream of the fluid having an oblong form in cross-section, whose thickness bears a considerable proportion to its width, so that its cross-sectional area will be large compared with its perimeter, as distinguished from an annular film of elastic fluid whose cross-sectional area is small compared with its perimeter. By this means the surface friction is greatly reduced and the efficiency largely increased.

(Here follow diagrams marked pages 776, 778, 780 and 782.)

In the accompanying drawings, forming part hereof, Figure 1 is a vertical section taken through the central line of one set of passages of my preferred form of apparatus. Fig. 2 is a similar section, on a smaller scale, of an apparatus of the same kind designed to work with a different exhaust-pressure. Fig. 3 is a section on the same scale as Fig. 1, in partial elevation, of an apparatus working under the same conditions as the apparatus of Fig. 1, but having the expansion take place in the working part of the apparatus wholly in the stationary intermediate passage. Fig. 4 is a horizontal section through the delivery-nozzle, stationary intermediate passage, and exhaust-opening of the apparatus of Figs. 1, 2, and 3, the rims surrounding the two circular ranges of vanes being partly broken away to disclose the vanes, which are developed in a horizontal plane. Fig. 5 is a view in diagram illustrating a modified form of the delivery-nozzle. Fig. 6 is a sectional view similar to Fig. 1 and on the same scale, showing a form of apparatus employing four sets of movable vanes. Fig. 7 is a sectional view similar to Fig. 4 of the apparatus of Fig. 6. Fig. 8 is a vertical section of an apparatus having four sets of movable vanes mounted on separate wheels and connected by single or undivided stationary passages, the view being on one-half the scale of Fig. 6. Fig. 9 is a sectional view, in partial elevation, of an apparatus corresponding to Fig. 8, but proportioned so that a part of the available pressure is converted into velocity within the working part of the apparatus. Fig. 10 is a sectional view taken horizontally through the passages of the apparatus of Figs. 8 and 9; and Fig. 11 is a vertical section on the same scale as Fig. 1, showing an apparatus with oppositely-rotating sets of movable vanes and without stationary intermediate passages.

Referring particularly to Figs. 1 to 4, A is a shaft mounted in suitable bearings *a* and passing centrally through a fluid-tight case B. Within the case B, the shaft A carries the wheel or drum C, upon the rim of which are mounted two sets D D' of curved vanes, each set forming a complete circular range of such vanes extending entirely around the rim of the drum. The vanes of each set are covered at their outer sides by hoops or rings *b*. The vanes form horizontal passages parallel in one plane with the shaft A across the portions of the rim of the drum which they occupy, these passages being closed at their bottoms by the rim of the drum, and at their tops by the rings *b*.

E is the stationary intermediate passage, which is carried by the shell B and occupies the space between the sets of vanes D D' in line with the delivery-nozzle and the exhaust-opening, this passage being closed at its bottom by the plate *c*.

F is a pipe extending from a steam-boiler or other source of elastic fluid under pressure and connected at its end with the expansion-nozzle G, which extends through the side of the shell B and approaches as closely as practicable the receiving ends of the first set of movable vanes D, leaving clearance enough, however, for free rotation. The receiving end or throat *d* of the expansion-nozzle G is smaller than its discharging end *e*, in order to cause

an expansion and convert the pressure of the elastic fluid into *vis viva*.

H is the exhaust-opening, leading out of the shell B opposite the vanes D', from which the fluid-jet is discharged. This exhaust-opening may be connected with a condenser or other means for producing less than atmospheric pressure, or it may open into the air.

To comprehend the design of this apparatus and its mode of operation, it is necessary to analyze what takes place at all points in the passage-way through which the jet of steam flows from the nozzle to the exhaust. The nozzle being set at the desired angle with reference to the plane of the wheel, the virtual angle at which the fluid enters the buckets or vanes depends upon the velocity of these vanes as compared with the actual velocity of the fluid and is the resultant of these two velocities. Since the velocity of the vanes bears a material ratio to that of the fluid, it follows that the virtual angle of entrance is somewhat greater than that of the nozzle, and therefore the receiving ends of the vanes should be set at this increased angle in order to avoid impingement of the jet on the rear

faces of the vanes. The fluid having entered the movable

786 passages, sufficient cross-section must be provided to convey it and discharge it freely on the other side. If we were dealing with a non-elastic fluid, such as water, no expansion or enlargement of the movable passages would be needed, because so long as the angle of the tails of the vanes or buckets is the same as or at least no less than the angle of the nozzle, the tails of the passages are necessarily mathematically capable of discharging the same quantity of fluid that is delivered by the nozzle, and hence no enlargement of these passages is necessary. With an elastic or expansion fluid the same is true merely as regards conducting the fluid; but in order to permit an expansion of the fluid in the movable passages themselves and thus maintain a drop in pressure between the ends of such passages, as I prefer to do, I provide an actual enlargement in these passages. This may be done either by diverging the top and bottom walls or by setting the tails of the buckets at a greater angle than that of the nozzle, thus providing a virtually-increased cross-section of passage at this end; but I prefer to obtain it in the former way, and the amount of such expansion will, of course, depend upon the respective pressures it is desirable to maintain at these points and the corresponding volumes. Owing to the fact that the vanes themselves have a velocity which is considerable compared with that of the fluid, the latter issues from the vanes at an angle which is materially greater than that of the tails, this angle being the resultant of the combined velocities of the fluid and vanes. In order therefore to receive the fluid as it enters the stationary passage at a reduced velocity, I set its receiving end E at an angle which is the same as that at which the fluid enters it, the opening being just sufficient to include all the fluid which escapes from the wheel, and the mere fact of setting the passage at this angle mathematically provides the increased cross-section necessary to convey the fluid at the reduced velocity. From this point to the delivery end of the stationary passage the cross-section

measured at all points at right angles to the direction of flow should be at least preserved. In order to provide for friction and maintain the flow and prevent or diminish the formation of eddy currents, I provide a gradually-increasing cross-section in the stationary passage, as well as in the movable passages, this increase in cross-section being adapted to permit the necessary expansion to maintain the desired drop in pressure between the terminals of the passage. This increase in cross-section may be secured in several ways. As shown in the drawings, it is obtained by increasing the depth or radial dimension of the passage; but it may, evidently, be obtained by increasing the width or circumferential dimension, or both. If the stationary passage be curved around so as to deliver the fluid to the second set of vanes at an angle equal to that of the nozzle, as is desirable, a considerable increase in the radial dimension is necessary to make up for the reduced width of the passage resulting from the reduced angle of its walls and to provide for the additional enlargement necessary to permit the desired expansion. The illustrations herein given in the drawings are not intended to show the exact relative proportions of the parts, but merely show the general plan of operation. In the second set of movable passages the conditions are similar to those existing in the first set, the angle of the receiving ends of the vanes in this case being, however, somewhat greater, owing to the fact that the velocity with which the jet strikes the vanes is less, while the velocity of the vanes remains the same, (if these two sets of vanes have the same diameter or are moving at the same rate of speed,) so that the virtual angle of entrance into these passages is somewhat greater than in the first set. For a like reason the angle of issue from the second set into the second stationary passage will be somewhat greater than in the first set, and hence I set the receiving end E' of this passage at an increased angle. The receiving ends of the subsequent vanes, both movable and stationary, are likewise set at progressively-increasing angles, provision being made in this way for the reduction in the jet's velocity, which takes place in its flow through each set of movable passages. In each of the subsequent movable and stationary passages, as in the first, I provide the proper expansion in each portion, so as to maintain the desired pressure difference, the pressure gradually declining through the system and issuing from the last set of vanes with little or no residual pressure above that of the exhaust. It is preferable that the desired expansion should take place in both the movable vanes D and the stationary passage E , as illustrated in Figs. 1 and 2, so as to obtain a gradual expansion throughout the system, whether composed of two or more sets of movable vanes, but the requisite expansion may entirely or largely take place in the stationary passages E , as illustrated in Fig. 3, in which case the passages formed by the vanes D have parallel top and bottom sides, the essential point being that the cross-sectional area of the stationary passage E shall be sufficiently larger than the cross-sectional area at the discharging end e of the nozzle G to accomplish the result stated. The second set of vanes D' may also flare outwardly, or expand, as

shown in Figs. 1 and 2, or they may have parallel sides, as shown in Fig. 3. I prefer, however, to have the expansion take place also in the movable passage, so as to provide sufficient expansion to take care of the frictional retardation in the movable passage itself.

In Fig. 5 is illustrated a construction in which the side walls of the nozzle are parallel; but the proper relation is maintained between the receiving and discharging ends d e to give the desired conversion of pressure into velocity. This form, while not so effective, gives approximate results with low ratios of expansion.

The discharging end e of the nozzle G may be sufficiently larger than the receiving end d to convert the pressure wholly into velocity, except an amount of pressure required to supply the frictional consumption of energy in the working part of the apparatus and to maintain the flow without developing eddy-currents or what may be termed "heterogeneous motion," or the ratio of expansion between the receiving and discharging ends of the nozzle may be lessened, so as to deliver the fluid to the first set of vanes at a pressure higher than that thus required. I prefer the former plan. It is desirable that the steam should strike the first set of vanes at as high a velocity as possible, because the greater the velocity at which it strikes the first set of buckets the greater the work done in the first set, and hence fewer successive passages are required to abstract all the energy it contains. By using an expansion-nozzle properly proportioned the maximum velocity may be obtained that is possible while still leaving sufficient pressure above that of the exhaust to cause the flow in the most efficient manner, thus securing the highest aggregate amount of *vis viva* at the various points of action and therefore the greatest effect possible from the fluid.

The difference in pressure that it is desirable to maintain between the terminals of the working passages of the machine depends upon the length, size and general proportions of and the number of bends in the working passages and the character of the surfaces over which the fluid sweeps, and can only be determined by trial in each particular style or size of machine. In large machines this quantity will be less than in small machines, and in machines highly compounded it will be greater than in those compounded to a less degree. Let us assume, for illustration, the particular case where the boiler-pressure is one hundred and fifty pounds and the exhaust two pounds per square inch, (corresponding to about twenty-six inches vacuum,) these pressures being absolute and not by gage. Let us assume that a pressure of, say, five pounds above that of the exhaust is necessary to overcome friction and to cause the flow of the fluid through the working passage in the most efficient manner, that is, so as to obtain the highest aggregate velocities possible at the several points of action, this figure being used merely as an illustration. Under these circumstances the pressure at the delivery end of the nozzle should therefore be five pounds above that of the exhaust, or seven pounds, (absolute.) The true proportions of the nozzle can then be determined as follows: The small or receiving end is made just large enough to permit the

required quantity of steam to flow to develop the power the turbine is designed for. This can be ascertained empirically, or it may be calculated approximately by taking the pressure at this point, which will be approximately fifty-eight per cent. of the boiler-pressure (measured above the exhaust) and calculating the velocity developed at this point due to the drop in pressure. This velocity can be calculated by taking the heat-units or equivalent work in foot-pounds performed by the steam in thus expanding and calculating the equivalent velocity of the fluid, assuming that all the energy in foot-pounds becomes converted into an equivalent amount of *vis viva*. Under the conditions assumed the pressure will be about ninety pounds and the velocity between thirteen hundred and fourteen hundred feet per second at the receiving or small end of the nozzle. Knowing the velocity and the density of the fluid, the size or cross-section of the receiving end of the nozzle necessary to conduct a given amount is easily determined. In a similar way the size or cross-section of the large or delivery end of the nozzle can be computed by first ascertaining the velocity of flow developed by dropping the required pressure at this point, and then, knowing the density from the pressure, furnishing just sufficient cross-section at this point to conduct the same quantity of fluid as passes through the small end, allowance being made in the case of a saturated vapor, such as steam, for the condensation and consequent diminution in volume, which takes place during the given expansion. In the case assumed as an example a drop in pressure from one hundred and fifty pounds to seven pounds would develop a velocity of about three thousand one hundred feet per second, and the condensation would be about fifteen per cent. so that the volume would be less by fifteen per cent. than what it would be were there no condensation. In the case assumed the cross-section of the larger end of the nozzle should be about five times as great as that of the smaller end, and this is the general proportion which it is intended to illustrate in Figs. 1 and 3, taken in connection with Fig. 4.

The apparatus illustrated in Fig. 2, taken in connection with Fig. 4, is intended to represent a machine designed to work between a boiler-pressure of one hundred and fifty pounds and atmospheric pressure; in other words, a non-condensing machine. In this case if the loss by friction represents, say, five pounds of the whole available pressure, as before, the pressure at the delivery end of the nozzle will be about twenty pounds, the speed of the jet will be about two thousand six hundred feet per second, and the discharging end of the nozzle will be about twice as large in cross-section as the receiving end. The excess of pressure at the discharging end of the nozzle over the atmospheric pressure at the exhaust will be that re-

788 **quired to overcome friction in the working passages of the apparatus and maintain the flow therethrough in the most effective manner, as before.** It is highly important that the large end of the nozzle be no larger than just sufficient to conduct the required volume at the pressure and velocity designed to exist at that point, for otherwise the passage would be too large, and there would be a less velocity at this point than should exist there, resulting

in a loss of power. It must be borne in mind that the effect obtained from the fluid is as the square of its velocity at the time it is acting on the vanes, and that therefore a slight change in velocity causes a very considerable loss of power. For this reason it is highly important that the correct and highest available velocities be obtained at all points where the fluid acts upon the vanes. It is better to ascertain the exact proportions between the receiving and discharging ends of the delivery-nozzle by careful trial, the result being to some extent influenced by friction in the nozzle itself, the best plan being to vary the size of the large end of the nozzle, keeping the small end constant until a pressure is obtained at this point which is only just efficient to overcome friction and tendency to reconversion into pressure in the working passage beyond, and at the same time the cross-section is only just sufficient to conduct the quantity of steam flowing at the particular pressure and velocity existing at this point. After passing through the first set of vanes or movable passages the steam or fluid emerges with a reduced velocity. In the case of two movable passages let us assume that forty per cent. of the velocity of the fluid is abstracted at each passage, leaving only twenty per cent. of the original velocity as it enters the exhaust, corresponding to four per cent. of the original energy. Since the energy is proportional to the square of the velocity, it is evident that the energy extracted by the first movable passage will be sixty-four per cent. while that extracted by the second movable passage will be thirty-two per cent., of the total original energy. On emerging from the first set of movable vanes and as the steam-jet enters the second set of movable vanes from the stationary passage its velocity will therefore have been reduced by forty per cent., and it will now have sixty per cent. of its original velocity. Since the stationary passage is increased in size inversely as the velocity of the steam-jet, it follows that under the assumed conditions, the stationary passage E will, from this cause, be required to be made $100/60$ or 1.66 times larger in cross-section than the delivery end e of the nozzle G. At the same time provision should be made for expanding the passages to a further extent, as already explained, to cause the desired decline in pressure to overcome surface friction and the tendency to reconvert velocity into pressure by eddy-currents, this decline in pressure being, under certain conditions, a considerable portion of the total drop in pressure in the working passage of the turbine. The entire increase in the cross-sectional area at the point f over the point e is therefore the product of these two ratios, and this is the proportion intended to be illustrated in Figs. 1, 2, and 3. By observing this relation of the parts an economical conversion of the pressure into *vis viva* and of the *vis viva* into mechanical power will be obtained, while the speed of the movable vanes will be only a fraction of the speed of the fluid-jet.

The proper decline in pressure of the steam in passing through the turbine depends upon so many conditions that it is best in every case to determine it by experiment. It will be greater in traversing the first set of vanes than in subsequent ones, owing to its higher velocity, and likewise it will be greater in traversing the first set of stationary vanes than in subsequent ones for the same reason. Al-

lowance should also be made for the fact that the steam in sweeping against the concave vanes is compressed to a greater or less degree by its own centrifugal force, so that unless when it leaves each set of vanes it has reexpanded to its normal volume its density at these points will be less than would have been the case had there been no centrifugal compression. This compression may to a large extent be reduced by means of the straight or slightly-curved tails, (which I have shown especially in the case of the intermediate fixed vanes,) which allow the steam to flow for a certain length in a straight or slightly curved course, thus permitting it to expand again and assume more nearly its normal volume before delivery to the next set of vanes. By these means I am also enabled to reconvert the energy or work expended in centrifugal compression into velocity or partially into velocity again, thus recovering a large part of this energy and causing the fluid to impinge upon the second or successive sets of vanes with additional velocity.

Owing to the various conditions which affect the actual volume at the various points in the apparatus, the best plan is to ascertain the proper proportion of the various points in the passages by trial, the essential features of economical working being that the successive cross-sections of the passages should be just large enough to conduct the fluid without choking it or backing up the pressure at that point, and so as to obtain the highest velocities practically obtainable at the various points of action upon the blades, (that is, so as to obtain the greatest sum-total of all the actions upon the successive vanes,) and yet no larger than is necessary for this purpose; otherwise there will be too low a velocity and a corresponding loss of energy. If more than two sets of movable vanes be employed, the principle of operation and construction is the same, the delivery-nozzle having its receiving end of the precise size, required to pass the desired quantity of the fluid and its discharging end of a size as many times larger
 789 as may be required to expand the fluid down to the pressure required to overcome the frictional retardation in the working passages of the turbine and give the best result, while the delivery ends of the succeeding stationary intermediate passages will have their size increased in proportion as the velocity of the fluid-jet has been reduced and as its volume has been increased by the decline in pressure.

In Figs. 6 and 7 is represented a turbine having four sets of movable vanes $D D' D^2 D^3$ and three stationary intermediate passages $E E' E^2$ constructed and operating on this principle. In this case, and assuming that the apparatus is designed to work between the terminal pressures before taken for illustration, *i. e.*, a boiler-pressure of one hundred and fifty pounds and an exhaust-pressure of two pounds per square inch, (absolute,) the delivery-nozzle G will be proportioned in the manner described, so as to expand the steam down to a given pressure, say ten pounds at its discharging end, the remaining pressure above the pressure of the exhaust being that assumed to maintain the flow in the working passages. If the steam-jet enters the exhaust with twenty per cent. of the original velocity, each of the four sets of movable vanes will abstract twenty per cent. of the velocity and will in their order absorb, respectively, thirty-

six, twenty-eight, twenty, and twelve per cent. of the energy represented by the original velocity, while four per cent. of the energy will pass off as residual velocity in the exhaust. The decline in pressure in the working passages will be such that at the discharge ends f , f' , and f^2 of the stationary intermediate passages the pressures will be less and less, declining at a certain rate, which should be found by experiment in each particular type and size of machine, and owing both to reduced velocity and to increased volume of the fluid-jet arising from reduced density the cross-sectional areas at the points f , f' , and f^2 will be correspondingly increased over the cross-sectional area of the discharge end e of the nozzle and over each other successively. The expansion in the working passages is shown in full lines as taking place in both the movable and stationary passages, while by the dotted lines this expansion is shown as taking place wholly in the stationary passages. I prefer the former plan.

In Fig. 8 (taken in connection with Fig. 10) is shown an apparatus designed to have the same proportions of the expanding-nozzle and the working passages and to operate under the same conditions as the apparatus of Figs. 6 and 7. It has the peculiarity in construction of having the different sets of movable vanes mounted upon separate wheels. It also differs in the construction of the stationary intermediate passages, which will be presently described.

In Fig. 9 (also taken in connection with Fig. 10) is shown an apparatus in which the two operations of converting the pressure into *vis viva* and *vis viva* into mechanical power overlap to a greater extent, although the useful or available pressure is still largely, although not wholly, converted into *vis viva* by the expansion delivery-nozzle, which delivers the fluid-jet to the first set of movable vanes at a pressure greater than is required to overcome frictional retardation in the working passages of the apparatus. In other words, the apparatus of Fig. 9 is designed to convert into *vis viva* in its working passages a part of the pressure which, in the constructions before described, is converted into *vis viva* by the expansion-nozzle. Taking the illustration of terminal pressures of one hundred and fifty pounds and two pounds per square inch (absolute) and assuming, as we did for the apparatus of Fig. 8, that a pressure of eight pounds above the exhaust-pressure is required to overcome frictional retardation in the working passages, the apparatus of Fig. 9 is designed to have a pressure of, say, twenty pounds at the delivery end e of the nozzle G, and the remaining expansion required to convert the balance of the useful pressure (ten pounds) into *vis viva* takes place between the delivery end e of the nozzle G and the delivery end f^2 of the stationary passage E^2 . To accomplish this, the delivery end e of the nozzle G and the delivery ends f , f' , and f^2 of the stationary passages E, E' , and E^2 are given cross-sectional areas, increasing in size from one end of the apparatus to the other, the increase at each point being just sufficient to take care of the increased volume of the fluid at each point and also to allow for the diminished velocity resulting from its passage through the previous set of vanes. The expansion for converting the balance of the useful pressure into *vis viva*, which takes place in the working passage of the apparatus of Fig. 9, may

take place uniformly in both the movable and stationary passages, as illustrated, or it may take place wholly in either the stationary or movable passages or in a part of the working passages, either movable or stationary, or both, but I prefer to enlarge both the movable and stationary passages uniformly. At the same time that the expansion of the working passages to convert the balance of the useful pressure into *vis viva* is provided, those passages are expanded to compensate for reduced velocity and for frictional retardation. The proper proportions will accomplish this combined result. The proportions and pressures I have given are merely for purposes of general illustration to show the principles involved in the construction and operation of my apparatus.

Having thus described the principle of operation and construction of my compound turbine, I will now refer to some details of construction which have not been as yet specifically described. The vanes *g* of each set of movable vanes are curved from their receiving ends to beyond their centers, and from thence to their discharging ends they are straight or slightly curved or set at a lesser angle, as shown in Figs. 4, 7, and 10, so as to obtain as much effect as possible from the fluid before it leaves the vanes.

In Fig. 10 single or undivided stationary passages are shown. These are made wide enough at their receiving ends to receive the fluid-jet from all the movable vanes from which it may be discharged, (including the additional width made necessary by the spill of the fluid-jet,) and the receiving end of each stationary passage is given a lead, that is, set with a certain advance, if necessary, over the discharging end of the nozzle or previous stationary passage to properly receive the discharge from the movable vanes, it being remembered that, owing to the speed of the movable vanes themselves, the jet issues from them at a point slightly ahead of the point at which it is received. The amount of this lead should increase at each succeeding set of vanes, owing to the progressively-diminishing velocity of the fluid compared with that of the buckets, as indicated in the drawings. The diverging top and bottom walls of these passages serve not only to maintain the cross-sectional area, which would be contracted toward the discharging ends of the passages if such top and bottom walls were parallel, but also to give the necessary expansion to maintain the desired drop in pressure between the ends of the passages. Instead of using single or undivided stationary passages, as shown in Fig. 10, I prefer, under certain conditions, to use divided stationary passages, as shown in Figs. 4 and 7. These passages are made of sufficient width to receive the entire discharge from the movable vanes, when running at the normal speed, and may be made of additional width in succeeding passages to give the necessary lead to provide for any rate of speed. These passages are divided each into a number of narrower passages by vanes *h*, which have curved receiving ends and straight discharging ends, as have the movable vanes, and also have their receiving ends arranged progressively at a greater angle in the vanes of succeeding passages, as have the movable vanes in successive sets, in order to receive the jet properly and furnish the required cross-section. As in the case of single

fixed passages, the angles at which their receiving ends are progressively set will determine their respective cross-sections, and by making these angles the same as the angles of issues from the moving vanes the requisite cross-section will be provided.

Besides the forms of apparatus which have been described, many features of my invention are involved in the construction and operation of such an apparatus as that shown in Fig. 11, in which only movable vanes are employed in the working part of the apparatus, the sets of vanes being alternately mounted upon oppositely-rotating disks and delivering the fluid-jet from one set of movable vanes directly to another set without the interposition of stationary passages. It will be understood that the movable vanes have all the characteristics of the movable vanes already described, but that those on one disk are set or curved oppositely to those on the other disk. In the apparatus illustrated in Fig. 11 the expanding-nozzle is designed to convert all or the larger portion of the useful pressure into *vis viva*, although the overlapping of the operations of converting pressure into *vis viva* and *vis viva* into mechanical power can likewise be employed in an apparatus of this kind.

It will be observed that in all forms of the apparatus the steam or other elastic fluid is delivered to the working passages practically in the form of a solid stream or jet whose cross-sectional area is large compared with its perimeter, and that this jet acts at one time only on a small section of the vanes of a circular range. This arrangement has a great practical advantage over one wherein the fluid is delivered in the form of an annular film simultaneously to all the vanes of a complete circular range. In the latter arrangement, in order to reduce the total cross-section of the passage to that required and still have the proper velocity, the depth of the vanes has to be exceedingly small and the surface exposed to the flowing fluid is very large compared with the cross-sectional area of the passages. The result is great loss by surface friction and churning action, and in addition the clearance space is so extended that it becomes large in proportion to the area of the passages.

By the expression "frictional retardation" I mean to include not only the actual loss of energy by friction in the passages, but also the loss of energy in available form due to the reconversion of *vis viva* into pressure or heterogeneous vibration.

By the expression "expansion-nozzle" I mean any nozzle or delivery passage having an enlarged cross-sectional area toward its delivery end considered with reference to its narrowest part.

By the expression "working passage" I mean that portion of the apparatus through which the steam flows, beginning at the delivery end of the expansion-nozzle and ending at the exhaust, whether composed of vane passages or of vane passages and fixed passages.

It should be understood that the use of two or more sets of circular ranges of vanes through which the fluid passes in succession and of one or more circular ranges of vanes through which the fluid passes two or more times in succession are equivalent constructions and are intended to be included herein.

What I claim is—

1. In an elastic-fluid turbine, the combination with an expansion-nozzle, of movable vanes, and means for causing the fluid to act upon such vanes two or more times in succession, whereby the high velocity developed in the fluid by expansion in the nozzle is fractionally abstracted by the movable vanes, substantially as set forth.

2. In an elastic-fluid turbine, the combination with an expansion-nozzle, of two or more sets of rotating vanes, and one or more stationary intermediate passages connecting the sets of vanes, for causing the fluid to act on the vanes successively, whereby a high velocity is developed in the fluid by expansion in the nozzle and is fractionally abstracted by the rotating vanes, substantially as set forth.

3. In an elastic-fluid turbine, the combination with an expansion-nozzle, of a working passage expanding in the direction of the flow of the fluid, substantially as set forth.

4. In an elastic-fluid turbine, the combination with an expansion-nozzle, of a working passage comprising movable vanes and means for causing the fluid to act upon such vanes two or more times in succession, said working passage expanding in the direction of the flow of the fluid, substantially as set forth.

5. In an elastic-fluid turbine comprising a nozzle and a working passage comprising movable vanes to which the fluid is delivered two or more times in succession, a gradually enlarging or expanding passage-way for the fluid, part of the enlargement taking place in the nozzle and part in the working passage, substantially as set forth.

6. In an elastic-fluid turbine, the combination with an expansion-nozzle delivering the fluid at a pressure above that of the exhaust, of a working passage expanding to such an extent that the pressure at the end of the working passage is the same as the pressure in the exhaust, substantially as set forth.

7. In an elastic-fluid turbine, the combination with an expansion-nozzle adapted to convert the pressure of the fluid into velocity while retaining a pressure in the fluid above that of the exhaust, of an expanding working passage leading through a succession of revolving vanes, such passage having increasing cross-sectional areas sufficient only to conduct the required volume of the fluid at the maximum attainable velocity and yet not so contracted as to impede the flow, whereby the fluid is delivered to each successive set of vanes at as high a velocity as practicable, substantially as set forth.

8. In an elastic-fluid turbine, the combination with an expansion-nozzle adapted to convert the pressure of the fluid into velocity while retaining a pressure in the fluid above that of the exhaust, of a working passage enlarged or expanded in the direction of the flow of the fluid, such enlargement being sufficient to convert the remaining available pressure of the fluid into velocity before delivering it to the exhaust, substantially as set forth.

9. In an elastic-fluid turbine, the combination with an expansion-nozzle adapted to convert the pressure of the fluid into velocity while retaining a pressure in the fluid above that of the exhaust, of a working passage comprising two or more sets of rotating vanes and one or more intermediate stationary passages, such working passage

expanding in the direction of the flow of the fluid so as to deliver the fluid to each set of rotating vanes at the maximum velocities obtainable at each passage therethrough, substantially as set forth.

10. In an elastic-fluid turbine, the combination of an expansion delivery-nozzle placed obliquely, with two or more sets of rotating passages and one or more intermediate stationary passages, each of said passages having curved side walls having a less angle at the discharging end than at the receiving end of the passage, and with top and bottom walls diverging toward the discharging end of the passae to such an extent as to provide at the discharging end of each movable and stationary passage a cross-section greater than that at the discharging end of the preceding stationary or movable passage, substantially as set forth.

11. In an elastic-fluid-jet turbine, the combination of two or more sets of rotating vanes and one or more connecting stationary intermediate passages for delivering the fluid-jet to the successive sets of rotating vanes after the first, such stationary intermediate passages being set at their receiving ends at the same angle as that at which the fluid-jet is discharged from the rotating-vane passage, whereby the cross-sectional area provided for the jet in the stationary passage at its receiving end is substantially the same as the cross-sectional area of the fluid-jet as it is discharged from the respective rotating passages, substantially as set forth.

12. In an elastic-fluid turbine, the combination with two or more sets of rotating vanes, of a nozzle delivering a fluid-jet continuously to a portion of the vanes of one set, and one or more intermediate stationary passages connecting the rotating vanes, said intermediate stationary passage or passages having a lead or leads proportional to the diminished velocity of the fluid-jet, substantially as set forth.

This specification signed and witnessed this 8th day of January, 1896.

CHARLES G. CURTIS.

Witnesses:

EUGENE CONRAN,
JOHN R. TAYLOR.

799

DEFENDANT'S EXHIBIT 105.

No. 729,215.

Patented May 26, 1903.

United States Patent Office.

Charles Algernon Parsons, of Newcastle-upon-Tyne, England.

Steam-Turbine.

Specification Forming Part of Letters Patent No. 729,215, Dated May 26, 1903.

Application Filed October 6, 1902. Serial No. 126,247. (No Model.)

To all whom it may concern:

Be it known that I, Charles Algernon Parsons, engineer, a subject of the King of Great Britain and Ireland, and a resident of Heaton Works, Newcastle-upon-Tyne, in the county of Northumberland, England, have invented certain new and useful Improvements in Steam-Turbines, (for which I have made application for Letters Patent in Great Britain, No. 6,142, bearing date March 12, 1902,) of which the following is a specification.

My invention relates to steam-turbines of the Branca or de Laval type in which steam is expanded from the initial to the terminal pressure in one stage or operation. In such steam-turbines the steam is expanded in suitably-formed nozzles having a cross-section of expanding area, and a velocity is attained corresponding to the entire fall of pressure. Steam at this high velocity impinges on buckets or vanes formed to receive the impact and by deflection of flow secures reactive force upon the rotor. In turbines of this class as at present constructed certain difficulties are experienced, due principally to the extreme angular and peripheral velocities required by the rotating wheel. This gives rise to excessive stress in the material of the wheel, to difficulties in the transmitting-gear, and to frictional losses due to the high superficial velocity of a large wheel-surface immersed in the low-pressure steam.

The object of my invention is to greatly reduce the required angular and peripheral velocities, thus avoiding the difficulties of gearing down and to minimize the frictional losses due to rotation in the low-pressure steam, while greatly improving the efficiency of the turbine itself.

My invention consists, broadly, in a new steam-turbine of this class in which the steam-jets are caused to rotate in a direction opposite to the direction of rotation of the bucket-wheel, a high relative velocity between jet and bucket being thus obtained, while the actual angular and peripheral velocities are greatly reduced.

My invention further consists more specifically in the steam-tur-

No. 729,215.

PATENTED MAY 26, 1903.

C. A. PARSONS.
STEAM TURBINE.

NO MODEL.

APPLICATION FILED OCT. 6, 1902.

7 SHEETS—SHEET 1.

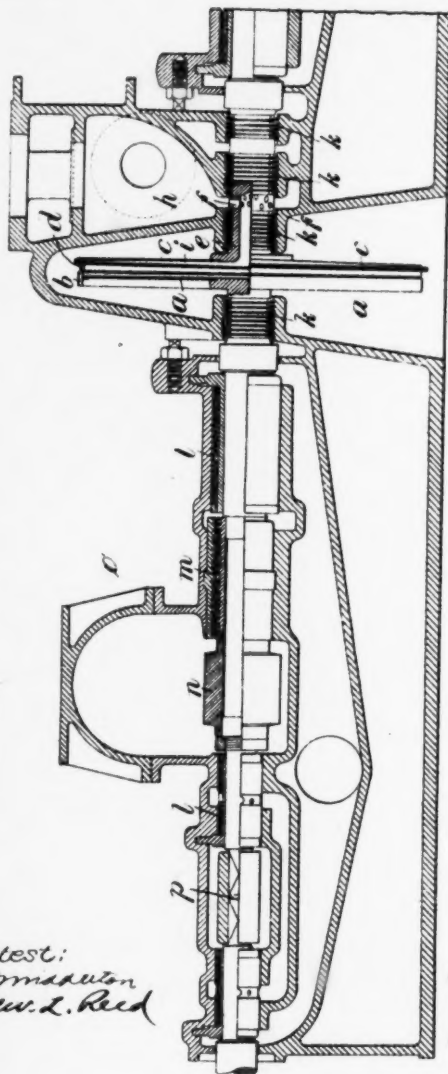
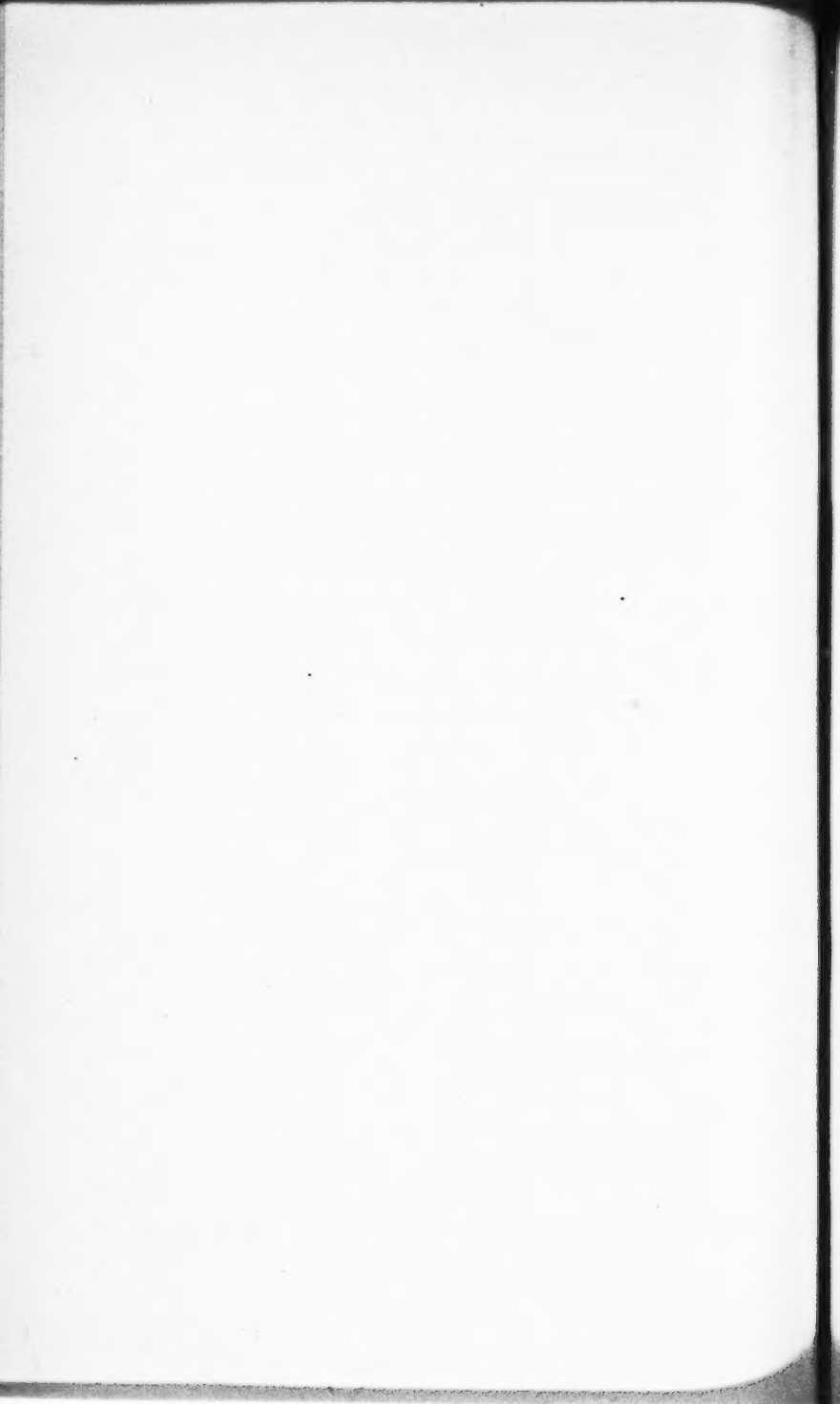


Fig. 1.

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 Edw. L. Reed

Inventor:
 Charles A. Parsons
 by Ellis Hoffman

Atty.



No. 729,215.

PATENTED MAY 26, 1903.

C. A. PARSONS.
STEAM TURBINE.

APPLICATION FILED OCT. 6, 1902.

NO MODEL.

7 SHEETS—SHEET 2.

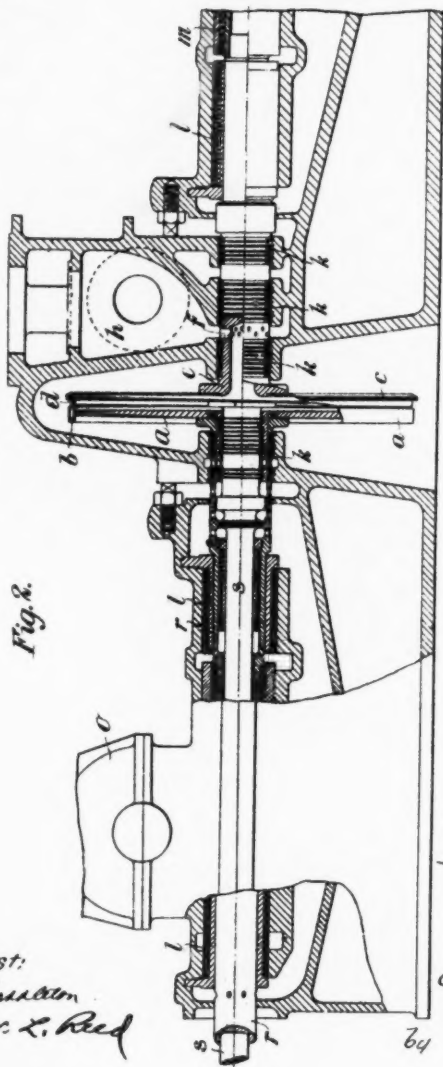


Fig. 2.

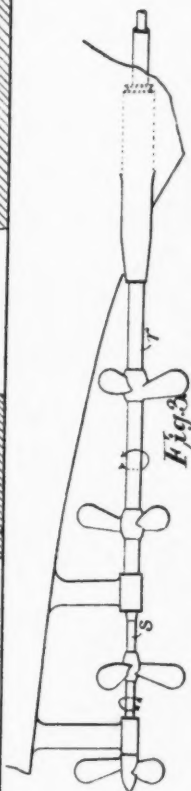


Fig. 3.

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Edw. L. Reed

Inventor
Charles A. Parsons
Elinor

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No. 729,215.

C. A. PARSONS.
STEAM TURBINE.

PATENTED MAY 26, 1903.

NO MODEL.

APPLICATION FILED OCT. 9, 1902.

7 SHEETS—SHEET 3



Fig. 6.

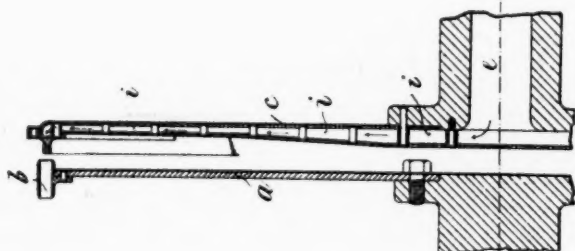


Fig. 4.

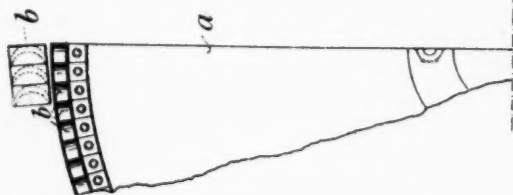


Fig. 5.

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Edward S. Sartor

Inventor
Charles A. Parsons

Ellis Spear

by

Attest



bines hereinafter described and in detail methods of applying it to various purposes.

By means of my new turbine I overcome the difficulties referred to above, an important departure in this invention being the great diminution of skin-friction on the moving elements which is secured. For instance, assuming as initial velocity of the steam discharged from the nozzles to be five thousand feet per second, a relative velocity between nozzle and bucket of fifteen hundred feet per second is necessary to secure good efficiency. With fixed nozzles this necessitates a peripheral velocity of the bucket-wheel of fifteen hundred feet per second, which is excessive for even the strongest materials; but the same relative velocity is secured by my present invention with a peripheral velocity for each element of only seven hundred and fifty feet per second, which involves only one-quarter the stress on the material of the disk. Comparing a given relative velocity between the rotating nozzles and the bucket-wheel and the same relative velocity in the turbine with fixed jets acting on a moving wheel the angular velocity being the same in each case, the diameter required for each of the two rotating wheels is only one-half of the single-wheel turbine, and therefore the surface of each disk is only one-quarter that of the older form. Further, the horse-power absorbed in overcoming the skin-friction of the disk varies as the cube of their mean superficial velocity and directly as the area exposed. Hence considering the outside surfaces only of the disk the horse-power absorbed is only one thirty-second part of that in the older form. With regard to the space between the two disks, assuming the loss equal to what it would be were one disk stationary and the other moving with the same relative velocity, the horse-power absorbed on this account is one-eighth part of that in the older form, so that summing up the total skin-friction losses in the double-moving-element type are only about one-sixth of those in the single-element type when constructed for the same relative velocity of jet and bucket. Thus a steam-turbine constructed in accordance with my invention, compared with a single-wheel turbine of the Laval type, giving the same theoretical efficiency, sets up stresses in the wheels of one-quarter, and gives steam-friction losses of only one-sixth of the Laval.

(Here follows diagrams marked pages 794, 796 & 798.)

800 Referring to the accompanying drawings, Figure 1 shows one form of my invention applied, for example, to the driving of dynamos. Fig. 2 shows another form suitable for marine propulsion, Fig. 3 being a detail view of one arrangement of propellers. Fig. 4 shows part sections of the turbine-wheels, and Figs. 5 and 6 corresponding elevations. Fig. 7 is a sectional elevation, showing one method of reversing, Fig. 8 being a view of the jet-wheel

shown partly as a section on the line A B of Fig. 7. Fig. 9 shows sections through the bucket and jet-wheels adapted for reversing according to another modification, while finally Fig. 10 is a sectional view showing a method of reversing one element only by means of a set of fixed jets.

According to one form of my invention I construct a rotating wheel *a*, (see Figs. 1 and 2,) carrying buckets *b* of suitable formation, such as are used in the Pelton wheels or in de Laval turbines. The actual vanes on which the steam impinges are so disposed that the steam after imparting energy to the buckets passes on direct to the exhaust without "rebounding" or interfering in any way with the action of succeeding jets. Adjacent to this bucket-wheel I mount a hollow wheel *c*, carrying the nozzles *d d*. I introduce steam at the initial pressure to the said hollow wheel by way of a hollow spindle or shaft *e*, the steam passing through holes *f f*, bored in this shaft on its way from the steam-chest *h*. The steam flows through the nozzles *d d* and impinges upon the buckets carried by the bucket-wheels. The wheels rotate in opposite directions and preferably at equal or similar angular velocities. Then as the reaction of the jets and the impact on the buckets are equal or similar on the assumption that the steam on leaving the buckets is at or nearly at rest and act in a direction tangential to the bucket circle the power delivered to each moving element will be the same. I prefer to mount the nozzles *d d* on the circumference of a suitably-constructed wheel *c* of steel (see Fig. 4) of coned formation for resisting centrifugal force and containing chambers *i i* for conveying the steam from the hollow of the shaft *e* near the axis. The wheel is preferably mounted overhung, as shown in Fig. 1, on a massive hollow shaft *e*, passing through the steam-admission chest *h* and suitably packed with dummy packings *k k* of my well-known construction. Beyond these packings I arrange suitable bearings *l l* for carrying the shaft. The other wheel or element *a*, carrying the buckets *b*, is similarly mounted on a massive shaft and runs in similar bearings. The end adjustment of the shafts is secured by adjustable thrust-bearings *m m*, by which means the steam-packings *k k* are maintained in close steam-tight adjustment and any end pressure due to the reaction of the jets or impact on the buckets is sustained. As indicated at *n n*, I may cut worms on the shaft-gearing with corresponding worm-wheels, (not shown,) the shafts of which may operate air-pumps or other auxiliary engines. The casings *e e* are those in which the worm-wheels run. The arrangement for oiling the bearings is according to my well-known method. When used for driving dynamos, I preferably couple a dynamo to each member by any suitable coupling *p p* and connect the dynamos in parallel. In some cases I may use concentric or hollow shafts and mount the armature and field magnets, respectively, on the two members. Any suitable method may be adopted for governing. When used for marine propulsion, (see Fig. 2,) I preferably use concentric shafts, such as *r s*, and mount on each one or more propellers, or bow and stern screws may be employed. A suitable arrangement of propeller is shown in Fig. 3, the outer shaft being

fitted with left-handed propellers and the inner shaft with right-handed ones.

I may so form the dummy packings $k k$ as to take some oil or all of the thrust, or, if desired, I may mount one or more balance-pistons fed with steam from the main steam-chest for the same purpose. I may also, if desired, have more than one row of jets and one row of buckets arranged, preferably, at different radii, but still keeping all the jets on one wheel and all the buckets on the other, or I may have one or more rows of jets and one or more rows of buckets combined on each wheel with corresponding rows of buckets and jets on the other wheel.

When reversing power is required, I may mount a separate set of nozzles supplied with steam from a separate set of passages and fed from a separate steam-chest. These jets will play on the reverse sides of the buckets or on special reverse buckets. According to one modification I carry this method of reversing into effect by means of the apparatus shown in Figs. 7 and 8. The jet-wheel c is made hollow, as described above, but it is divided by radial partitions $t t$ into segments $u u$ and $v v$. The segments $u u$, which are preferably larger than the segments $v v$, communicate by means of openings $w w$ in the wall of the jet-wheel with an annular passage x , cut in the shaft on which the jet-wheel is mounted, holes z being bored through the outside wall of this shaft to put the annular passage x into communication with the pressure-chest 2. The segments $v v$ can in this way be continuously fed with steam, which issuing from the nozzles d impinges on the buckets b and drives the turbine in the ahead direction. The smaller segments $v v$ are used for reversing purposes and communicate by means of holes $3 3$ with the central hollow e of the shaft, and thence by means of holes $f f$ with the pressure-chest h in a manner very similar to that described with reference to Figs. 1 and 2. These reversing-segments v may be supplied with reversing-nozzles, arranged at the same distance from the center of the shaft as the ahead nozzles d , in which case the jets will impinge on the reverse side of the buckets b ; but to insure a higher efficiency I

801 prefer to use special reversing-buckets 4, arranged at a somewhat less radius than the ahead buckets, as shown in Fig. 7, with corresponding nozzles 5 5. The path of the entering steam is indicated by the arrows.

I carry the broad method of reversing just described into effect according to a second modification, as shown in Fig. 9. Instead of dividing the jet-wheel segments by means of radial partitions I divide it into two portions by means of the partition 6, at right angles to the axis of the shaft. One of these portions 7 is provided with ahead jets d , as above, and communicates with its pressure-chest by means of holes w and annular passage x . The other portion 8 supplies steam to the reversing-nozzles 5, being itself fed with steam by way of the central hollow e of the shaft and holes 3 in a precisely similar manner to that shown in detail in Fig. 7. The reversing-nozzles 5 may be put at any convenient distance from the center of the shaft, the steam issuing from them impinging on the reverse-buckets 4.

According to another method of reversing I may cause one member

only to reverse by fixed jets playing on special reversed buckets. Fig. 10 shows one modification on apparatus for carrying this into effect. The bucket and nozzle wheels are arranged as in Figs. 1 and 2 and are denoted by the same reference-letters; but an annular passage (shown in section at 9) is secured to the main casing of the turbine and supplied with steam for reversing purposes through the opening 10. This annular passage distributes steam to the fixed reversing-nozzles 11, the issuing-jets playing on the reversing-buckets 12, or, again, I may reverse one or both members by fixed jets and rows of buckets mounted on the periphery of one or both members, as described in my United States Patent No. 553,659 for the application of the steam-turbine to marine propulsion.

Instead of one set of nozzles *dd* on one moving member, as described above in relation to the non-reversible type, I may have two or more sets of nozzles fed from separate steam chests or passages, (in a manner which will be evident from the description relating to Figs. 7, 8, and 9,) so that at reduced powers the number of jets may be reduced and the steam-pressure on the remainder may be increased for attaining efficiency.

By my new method I produce a steam-turbine remarkably simple construction which in operation allows great reduction in the losses from the skin-frictional resistance, and this renders the single-expansion type for the first time admissible for direct coupling to dynamos or screw-propellers or other purposes where the speed of revolution is moderate. Because of these serious skin-friction losses such single-expansions turbines have hitherto been made of smaller diameter and run at extreme angular velocities. Such velocities can only be satisfactorily utilized for the purposes above mentioned by using intermediate reduction-gear, a method of working which is not practicable except for comparatively small powers.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An elastic-fluid-pressure turbine of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one carrying expanding nozzles and the other carrying throughway-buckets, substantially as described.

2. An elastic-fluid-pressure turbine, of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one carrying expanding nozzles and the other carrying throughway-buckets said elements being mounted on shafts and rotating within a casing connected to the exhaust, substantially as described.

3. An elastic-fluid-pressure turbine of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one carrying expanding nozzles and the other carrying throughway-buckets said elements being mounted on shafts and rotating within a casing connected to the exhaust, in combination with packings to prevent leakage of the elastic fluid where said shafts pass through the walls of the casing, substantially as described.

4. An elastic-fluid-pressure turbine of the de Laval type, consisting of two coaxial elements, rotating in opposite directions, the one element being in the form of a hollow disk carrying expanding

nozzles, and the other element being in the form of a disk carrying throughway-buckets, said elements being mounted on shafts and rotating within a casing connected to the exhaust in combination with packings to prevent leakage of the elastic fluid where said shafts pass through the walls of the casing, substantially as described.

5. An elastic-fluid-pressure turbine of the de Laval type, consisting of two coaxial elements, rotating in opposite directions, the one element being in the form of a hollow disk carrying expanding nozzles and communicating with the pressure-chest by way of the hollow shaft on which it is mounted and holes through the walls of said shaft, and the other element being in the form of a disk carrying throughway-buckets and also mounted on a shaft, said elements rotating within a casing connected to the exhaust in combination with packings to prevent leakage of the elastic fluid where said shafts pass through the walls of the casing, substantially as described.

6. An elastic-fluid-pressure turbine of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one element being in the form of a hollow disk carrying expanding nozzles and communicating with the pressure-chest by way of a hollow shaft on which it is mounted and holes through the walls of said shaft, and the other element being in the form of a disk carrying throughway-buckets and also mounted on a hollow shaft which contains part of the shaft on which the nozzle element is mounted, said element rotating within a casing connected to the exhaust in combination with packings to prevent leakage of the elastic fluid where said shafts pass through the walls of the casing substantially as described.

7. In elastic-fluid-pressure turbines of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one element carry expanding nozzles and the other carrying throughway-buckets, means for reversing, consisting of a separate set of reversed nozzles supplied with the working fluid through a separate set of passages and fed from a separate pressure-chest, and separate reversed buckets against which the reversed nozzles cause the fluid to impinge.

8. In elastic-fluid-pressure turbines of the de Laval type, consisting of two coaxial elements rotating in opposite directions, the one element carrying expanding nozzles and the other carrying throughway-buckets, means for reversing consisting of a set of reversed nozzles in combination with buckets carried by one of the rotating elements.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES ALGERNON PARSONS.

Witnesses:

HENRY G. DAHYUS, JR.,
WILLIAM DAGGETT.

803 & 804

DEFENDANT'S EXHIBIT 106.

[Third Edition.]

No. 9496. A. D. 1904.

Date of Application, 25th Apr., 1904.

Complete Specification Left, 27th Feb., 1905—Accepted, 25th July, 1905.

805

Complete Specification.

Improvements in and Relating to Turbine Installations for Propulsive Purposes.

I, Sebastian Ziani de Ferranti, Engineer and Electrician, of 31, Lyndhurst Road, Hampstead, London, N. W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has for its object to effect improvements in turbine installations so as to make them specially suitable to the propulsion of motor torpedoes, submarine boats, and any boats or vehicles where it is desired to have a simple plant working from stored energy not only contained in the combustible, but also in 806 the form of compressed air, compressed gas, liquid air or gas, or a compound such as slow burning powders and the like, which are capable of giving off heat energy without the employment of oxygen derived from the external air.

The invention thus consists in a turbine installation adapted to utilise a given store of energy without the employment of oxygen other than that contained in said store in a more efficient manner than has heretofore been possible by any known means.

The invention further consists in certain adjuncts necessary for working the above installation to the best advantage.

Referring to the accompanying drawings which form part of my specification,

Figure 1 is a longitudinal elevation of a Whitehead torpedo driven in accordance with the present invention.

Figure 1a being a section through the engine room to an enlarged scale;

Figure 2 shows a detail of a combustion chamber in which the air is heated by a slow burning powder or the like;

Figure 3 shows an elevation of a special form of pump, while

Figure 4 is a longitudinal elevation partly in section of a submarine driven in accordance with the present invention.

I wish it to be understood that the drawings accompanying this specification are of a diagrammatic nature throughout and are not to be taken as working drawings.

Where desirable corresponding elements in the different figures are denoted by the same reference symbols.

According to my invention, I construct torpedoes of the Whitehead type and instead of fitting them with engines as at present, I supply the motive power by means of a multiple impact turbine having two oppositely running wheels, *a*, of any known type, which drive screws, *b*, preferably without intermediate gearing in opposite directions on two concentric shafts, one of which is shown at *c*. The turbine wheels may be of any of the forms described in a Provisional Application for Patent made by me and numbered 9495 of April 25th, 1904. Instead of feeding these turbines with working fluid in the shape of cold air derived from the storage of compressed air, *d*, carried in the torpedo, I first lead the air by way of the pipe, *e*, to the regenerator, *f*, through which it passes and receives heat from the exhaust from the turbine; thence suitable pipes, *h*, lead to the combustion chambers, *i*, in which the air is raised to a high temperature such as 1200° C. or thereabouts by burning in it a small amount of oil or like fuel, for example, stored in a reservoir, *k*, the fuel being fed by means of a pump, *m*, driven from the turbine, into the combustion chamber, *i*, in the form of finely divided spray. The pump is of special construction in order to enable it accurately to supply the charge of oil or the like and will be described later in this specification. The action of the pump may be assisted by feeding the oil to it under pressure derived from the air so as to assist the positive action of the valves and therefore to give an accurate quantity of combustible; to carry this method into effect, it is merely necessary to adapt the oil reservoir to withstand high pressures and to lead a pipe from the compressed air store, *a*, to the upper part of the reservoir, *k*. As an alternative the pump, *m*, may be dispensed with and the oil forced into the combustion chamber entirely by the compressed air. In either case only sufficient oil is delivered to raise the temperature of the working fluid to a point such that after complete expansion, it will not act detrimentally upon the running blades of the turbine. I effect the complete expansion of the fluid in the combustion chamber from a high temperature and pressure down to a little above atmospheric pressure and a temperature of about 100° C. by passing it through the divergent expansion nozzles, *n*, during its passage through which its pressure energy is converted into kinetic energy. The jets issuing from the nozzles, *n*, then impinge upon the blades of the turbine wheels and are passed backwards and forwards a sufficient number of times to extract sufficient of this velocity to ensure efficiency. The exhaust from the turbine I prefer to pass through the small regenerator, *f*, before mentioned by way of the exhaust pipes, *o*, thus serving to heat the air on its passage from the extra high pressure chamber, *d*, to the combustion chamber, *i*. Between the air chamber, *d*, and the turbine, a reducing valve and control gear such are usually employed at the present time in Whitehead torpedoes may be fitted; other usual parts of this type of torpedo such as the explosive head, *r*, balance chamber, *s*, buoyancy chamber, *t*, and horizontal and vertical rudders, *u*, are indicated in

Figure 1. It will be seen that on account of the greatly increased efficiency of the arrangement described above over those now in use, I am enabled to considerably reduce the volume of the air chamber, *d*.

Thus by the means described the compressed air is used on a highly advantageous cycle whereby about four times the horsepower-hours may be obtained in relation to using the air cold according to present practice, the fact of having air under pressure being taken advantage of for this purpose to give an internal combustion turbine of high efficiency.

According to another method I may supply the heat to the compressed air by means of a slow burning powder and I can do this (see Figure 2) by putting a charge of slow powder or like material, which may or may not contain a predetermined amount of water, into a tube or case, *e*, such as that containing a rocket, but of sufficient strength to resist the full pressure of the cycle. The end of this tube adjoins or projects into the heating chamber the hot gases from it mixing with the air flowing in from the jacket, as indicated by the arrows and heating it to the desired temperature. The mixture is then expanded in the nozzle and dealt with as above explained.

According to another method I replace the storage of compressed air by a storage of compressed oxygen. This when heated by burning in it oil or other suitable combustible, gives a much larger amount of energy than the air. On the other hand, the temperature given is very high, and the result from this combination is too small a quantity of high temperature working fluid to be capable of useful application. It is therefore essential with this method to introduce sufficient medium, which may be of an inert nature, to give the full amount of working fluid at a temperature not exceeding that which can be usefully dealt with that it is possible to get from the weight of oxygen and oil which can be carried. I accomplish this by means of introducing a fixed quantity of water, and mixing, evaporating and superheating this so as to produce the desired result. According to this method I let the discharge from the turbine wheels issue at the full temperature which these will stand for a short period. I pass this exhaust through a regenerator which is so arranged as to efficiently transmit its heat to the water to be used in the cycle. This regenerator in reality forms a partial boiler, as there is sufficient heat contained in the exhaust to heat the whole of the water up to the boiling point, and to evaporate about one-third of the whole at the working pressure. The water is forced through the regenerator chamber at a high pressure, preferably twice that of the working fluid in the combustion chamber. It is then discharged by means of spray nozzles into the combustion chamber where it is atomised due to the high velocity of issuing through small orifices, and also due to the heat which it contains, which is sufficient to break it up into steam and so intimately mix it with gases that complete evaporation takes place.

The heat contained in the water under pressure is sufficient to vaporise a portion of it. The steam thus formed internally atomises

the remaining water most effectually thus greatly assisting complete evaporation by the hot gases and final mixture therewith.

This method may also be advantageously employed in the cycle when the heat is derived from slow burning powder or similar source of energy.

808 The above cycle is generally similar to that described in my Patent Specification No. 13199/03, with reference to Figure 7, similar apparatus modified to meet the new conditions being employed to carrying it into effect. It will, however, be seen that whereas in my Specification, No. 13199/03, a compressor is needed as part of the complete plant, thereby giving rise to considerable negative work and loss of efficiency, in the present invention, this loss is done away with so far as the running of the torpedo is concerned, the whole object of my invention being to utilize a given store energy to the greatest advantage so that in the case of a torpedo, for example, a much greater range may be obtained for the same weight of working fluid or the same range as at present with a reduced weight of fluid.

According to a modification of this form of operation I may use a circulating pump attached to the evaporation chamber which is arranged to catch any liquid which falls therefrom and to force it, together with the rest of the water in the form of spray, again into the combustion chamber. This method is adopted in case the vaporisation of the water is not completed at the first passage into the heating chamber.

According to another method I may mix the water with the oxygen or with the oxygen and the oil, and force these into the combustion and evaporating chamber so that an intimate gas and spray mixture is formed which burns with a temperature not exceeding the maximum at which it is desired to work.

According to another method, instead of using liquid combustible, I may store gas under pressure in a separate reservoir, to be burnt with the air or oxygen. Any suitable gas such as coal gas or enriched water gas may be used, or acetylene stored under pressure or stored under pressure in connection with being dissolved in acetone, in much the same way as has been employed for train lighting. In the case of both the combustible when in the form of gas and of the air or oxygen, I store these separately at high pressure and use suitable reducing valves which gives an approximately constant pressure in the working chamber.

I may apply the system where water is introduced and used as described, to motors in which the energy is obtained from stored air under pressure, and oil or other fuel. In this case the full amount of fuel which the air will burn is introduced, and which without the addition of inert material would give too high a working temperature to be usefully employed. As seen in Figure 1, the water is pumped through the regenerator in parallel with the air by the pump m^1 .

According to another method I may combine the above systems in the form of supplying the heat energy from a slow burning powder or material which contains its own elements of combustion and the

inert body in the form of water pumped in as already described to the heating chamber. According to this last method I may pump the water through or around the chamber containing the slow burning powder or the like, so as to prevent any undue rise of temperature by transmission from the burning material.

Where the slow burning material can be supplied in the form of liquid, I prefer to mix the water with this and spray into the combustion chamber so as to get the most intimate possible mixture of the burning gases with the water, so as to obtain complete evaporation.

Where I use air or oxygen or the like as part of the motive fluid I may carry this in the liquid form either in a vessel incapable of standing much pressure in which gas will be given off to the atmosphere due to evaporation, or in a vessel which will stand the full working pressure of the cycle, said pressure being used to force out a sufficient quantity of the liquid for vaporisation under pressure and use in the cycle. Where the liquid is contained without being under much pressure it is necessary to force it by means of a pump for the purpose of evaporation, and use in the cycle. The liquid may be evaporated in one part of the regenerator as above explained, the other part being used for the purpose of raising

809 ing the temperature and evaporating the portion of the water which is used as the inert medium. Or on the other hand, the exhaust gases may first heat up and evaporate the water and still contain sufficient heat energy to usefully vaporise the liquid to be converted into gas as already described.

Where I desire to keep such a store of liquid oxygen, liquid air or the like with the minimum vaporisation, I use the gas given off by the same to pass round a jacket adjoining the chamber containing it, for the purpose of keeping down the conduction of heat to the store from the external air or surroundings; in other words, this evaporation is used as a refrigerator to keep down the temperature.

It is obvious that modification of the above class of operations may be introduced, and I do not confine myself to the exact methods which I have described herein. What, however, is common to all these methods is an immensely better use of the store of energy in the torpedoes than is practicable according to present methods, the turbine being specially useful in the form which I have described for taking advantage of the high temperatures which would be unworkable in an ordinary engine, as it is able to convert these temperatures into velocity and so work with medium temperatures on the moving parts.

The apparatus required to carry into effect the various modifications I have described is similar to that used in the various cycles of my Patents, Nos. 13199/03 and 1409/04; the operations of these cycles will be readily understood without further explanation in view of the detailed description given above with regard to Figure 1.

Where it is desired to deliver an accurate quantity of liquid, such as to the combustion or evaporation chamber of the turbine, in order to carry the working cycle into effect to the best advantage, I make a compound liquid pump. The larger or first cylinder, *w*, (see

Figure 3) is made in the ordinary way and delivers through the pipe, x , at say two or three times atmospheric pressure. This has an overflow relief valve, x^1 . The second or smaller capacity cylinder, 2, has valves seated with strong springs, and water is forced in, following the piston from the first pressure chamber, thus ensuring a full charge per stroke, the surplus passing the relief valve, x^1 , and if oil, being returned to the suction as indicated, the strong valve closing springs also prevent slip and an accurate amount of fluid of a predetermined amount is delivered.

I may apply these methods to the driving of the turbines of submarines or submersible boats when they are working under the surface. There are two forms of turbines which I prefer to use in connection with this invention. The first form employs as the working fluid steam superheated by internal combustion, as described in my Application for Patent No. 13199 of 1903.

According to the second method I employ an air internal combustion turbine as described in my Specification No. 1409 of 1904. Both these systems are further described and added to in my Application No. 9495 of April 25th, 1904, which specification specially describes the particular form of turbine which I consider most suitable for application in the present case.

According to the first method, (see Figure 4), I may carry a store of compressed air, d , or preferably compressed oxygen. I also carry liquid combustible, k , preferably in the form of oil. In some cases I may also carry hot water at high temperature and pressure in insulated storage tanks or vessels; or I may so construct the boiler, 4, with sufficient extra water space to effect the same purpose. Where water is carried hot under pressure in the boiler or separate tank, I prefer to work the boiler at about 50% higher pressure than that at which steam is used in the internal superheating chamber, adjoining the turbine. The extra water carried may be used below the surface to give off steam which will be superheated by means of internal combustion as already described before being passed to the expanding nozzles. In some cases I may simply draw the

810 hot water under pressure from the store which is carried and use this, which will partially flash into steam in the combustion chamber, atomised so as to mix most completely with the burning gases and pass into the nozzle in the form of highly superheated steam and products of combustion. In some cases I simply obtain the necessary heat from the compressed air or oxygen and oil which I carry in the boat, pumping water at high pressure through the regenerator and into the combustion and superheating chamber, the evaporation being thereby effected as already explained in the above cases referred to; in all these cases the store of compressed fluid takes the place of the compressor in my previous patents above referred to.

The above arrangements are all for working under water but may also be used just before going under water or for running short distances on the surface where it is desired to emit no smoke from the boilers, which should be oil fired.

In some cases it may be advantageous to work boats of this class when using this cycle of operations, by means of compressed air

obtained from a running compressor when on the surface, the power provided in the compressor being greater than would be required in the ordinary case and so dispensing with a separate boiler. In this case, the regenerator is made of ample capacity and the water pumped through it, during which operation, sufficient heat is given to raise the whole of the water to boiling point and also to evaporate one-third; this cycle has already been referred to as similar to that above described with reference to Figure 7 of my Patent Specification, No. 13199/03. This disposition of parts greatly assists in atomising the water when it is driven into the combustion chamber and obtaining a mixture so intimate with the burning gases that complete evaporation is obtained. The compressor according to this arrangement of parts is preferably driven from the turbine through a clutch, so that it may be disconnected for working under water and the store of air compressed by it utilised.

According to this method of operation, additional power can be obtained from the cycle by means of allowing the exhaust, consisting of steam and products of combustion, to evaporate water which is used in a condensing turbine, as described in my Patent Specification No. 13199/03, the evaporation taking place at or about atmospheric pressure. In this case it is desirable to install the turbines worked in this way on the main propeller shafts, so that the additional power may be obtained under water.

According to the second method, where I employ an internal combustion turbine such as I have already described in my various applications for patents mentioned herein (for example, No. 1409/04) for running on the surface, I may use the methods already described for under-water working. Thus when on the surface, the combustion chambers are fed with air from the compressor, while when below the surface, the compressor is preferably stopped—*e. g.*, by unclutching it, if driven from the turbine—and the combustion chambers fed direct from the store. Either a separate set of chambers and nozzles is provided for the two methods of working or else the same combustion chambers are used in both cases. Suitable valves and connections of any known type are provided for rapidly changing the operation of the turbines from the simple air oil cycle for surface working to that in which air or oxygen previously stored and oil are used for under-water working, water being added in the case of stored oxygen as already fully explained above.

I may modify the above second method of operation by driving as a simple air turbine above water as already explained in which case sufficient air is compressed not only to burn the combustible but also to act as the inert matter to utilise properly the heat generated or I may draw a portion of the fluid to be compressed from the outside air sufficient for complete combustion, the balance of the working fluid being drawn from the exhaust after passing through a final cooler and after compression to the maximum pressure.

S11 For below water working the only change necessary is to replace the fresh air of the working fluid by air drawn from the pressure storage tanks or from a store of liquid air carried or by oxygen sufficient to burn the fuel, this oxygen being obtained either

from cylinders of compressed gas or from a storage of more or less pure liquid oxygen carried in the vessel.

The advantage of this modification of my second method is that no supplementary or different combustion chamber and nozzle arrangements are required for under water working, the valve which cuts off the fresh air supply to the compressor being connected to open out the supply from the storage system.

Supplementary compressing cylinders may be fitted to the ordinary working pumps or compressors according to the first and second methods in order to raise the air to storage pressure whilst working on the surface ready for operation under the surface.

The object of my methods of driving submarine or submersible boats is to enable the boat to be so fitted that the same driving mechanism which propels it on the surface is able to be used with the highest possible economy below water in relation to the amount of propelling material which is stored and carried in the boat for under surface working.

In order that some idea of the improved results likely to accrue from the use of my invention may be realised, I give here certain approximate relative figures for the case of a torpedo.

Thus, taking first the case of an ordinary Whitehead torpedo, I assume a certain definite weight is available for the store of compressed air and the metal shell or envelope containing it, and I represent the number of horse-power-hours obtainable from this weight by unity.

Then with the same weight available in each case:

(1) Using oil and excess of air injected into the combustion chamber, as described in my Application No. 1409/04, I obtain the comparative figure 4.6 as representing the number of horse-power-hours obtainable.

(2) Using oil and just sufficient air for combustion and water raised to the boiling point in the regenerator before injection into the combustion chamber I obtain the figure 8.6.

(3) Using oil and just sufficient oxygen for combustion together with water, all of which is raised to the boiling point in the regenerator and 37% evaporated therein, I obtain the figure 30.2.

(4) Using the same media as in (2) but carrying the air in the liquid state, I obtain (a) with a double casing for the air, *i. e.*, a refrigerating jacket as described above, the figure 18 and (b) with a single casing, the figure 25.1.

(5) Using the same media as in (3) but carrying the oxygen in the liquid state, I obtain (a) with a double casing, *i. e.*, a jacket, for the oxygen, the figure 52.5 and (b) with a single casing, the figure 69.6.

The methods which I have described are such as to give great economy and therefore to give the largest number of horse-power hours for the weight of stored material which is carried. A further great advantage in relation to other methods is that maximum horse-power may be obtained for moderate periods of time in running under water; or on the other hand the storage by this method and special adaptation to the turbine may be so used as to give considerably more

than the surface working maximum for short periods of increased speed under water.

I may also use the same methods of operation for the propulsion of motor cars or other vehicles where it is desired to obtain great simplicity. These may be worked in other respects according to Application No. 1409 of 1904 already filed by me; the difference, however, being that instead of carrying a compressor, they carry a store of air or oxygen in the liquid or pressure form together with sufficient water to form the inert part of the working fluid, the exhaust, however, after passing through the regenerator being finally cooled in

a condenser, so as to recover the water as far as possible for
812 future use in the cycle. By means of carrying compressed oxygen, in which oil is burned and using water, which is dealt with as already explained, I am enabled for the weight carried to get a very large number of horse-power-hours, and by means of a very simple and durable plant to get results much better than can be obtained, as regards weight and distance travelled, by means of accumulator traction.

Although I have described three ways in which my invention may be carried into effect, viz., for driving torpedoes, submarines and submersibles, and road vehicles, I wish it to be understood that what I have described above as applying to one of the above may in some cases be applicable to another, and in the appended claims I have used the word "automotor" in its generic sense to include any or all of the above applications.

I also wish it to be understood that by the term "internal combustion turbine," I intend to include only those cases in which the energy derived from the combustion of the fuel is imparted to the working fluid previous to or during its expansion in the fixed parts of the turbine and not on its passage through the blades.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In an automotor, the use of a turbine fed from energy stored in fuel such as oil or gas under pressure and an oxydiser such as air or oxygen stored under pressure or in liquid form, substantially as and for the purpose described.

2. In an automotor such as claimed in Claim 1, adding to the working fluid inert matter such as water carried in a storage tank or pumped in from the outside, substantially as and for the purpose described.

3. In an automotor such as claimed in Claims 1 or 2, adding inert matter to the cycle in the form of exhaust products, substantially as and for the purpose described.

4. An automotor turbine driven boat which when working on the surface uses air pumped from the outside and which when under water uses stored air, oxygen or like oxydiser to burn the fuel used in the cycle, substantially as described.

5. In an automotor boat such as claimed in Claim 4, adding inert matter to the working fluid in the form of water or of products of combustion, substantially as described.

(2nd Edition)

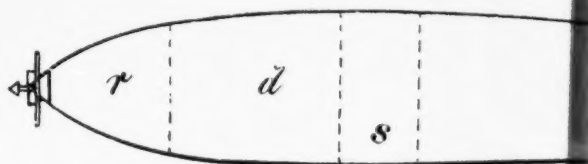


Fig. 1.

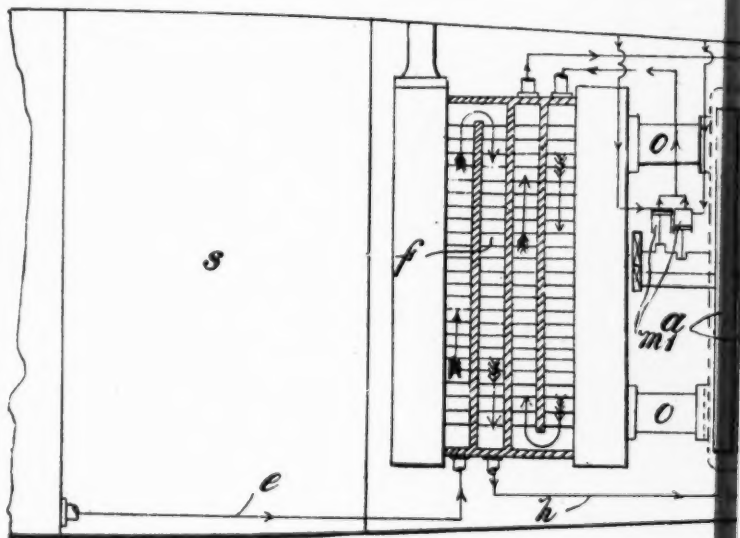


Fig.

[This Drawing is a full-size reproduction of the Original.]

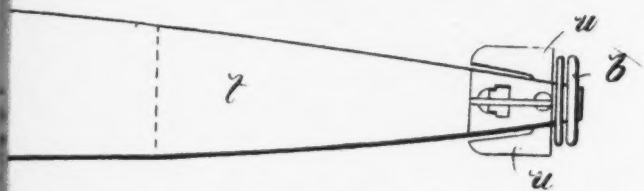


Fig. 1.

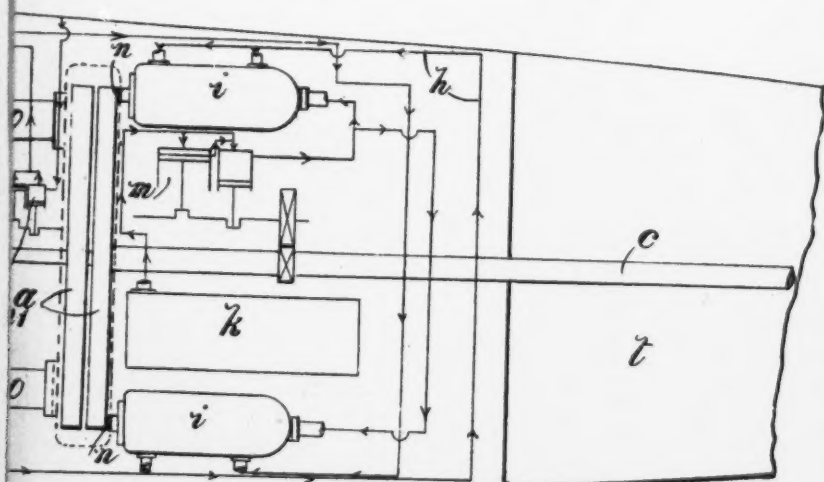
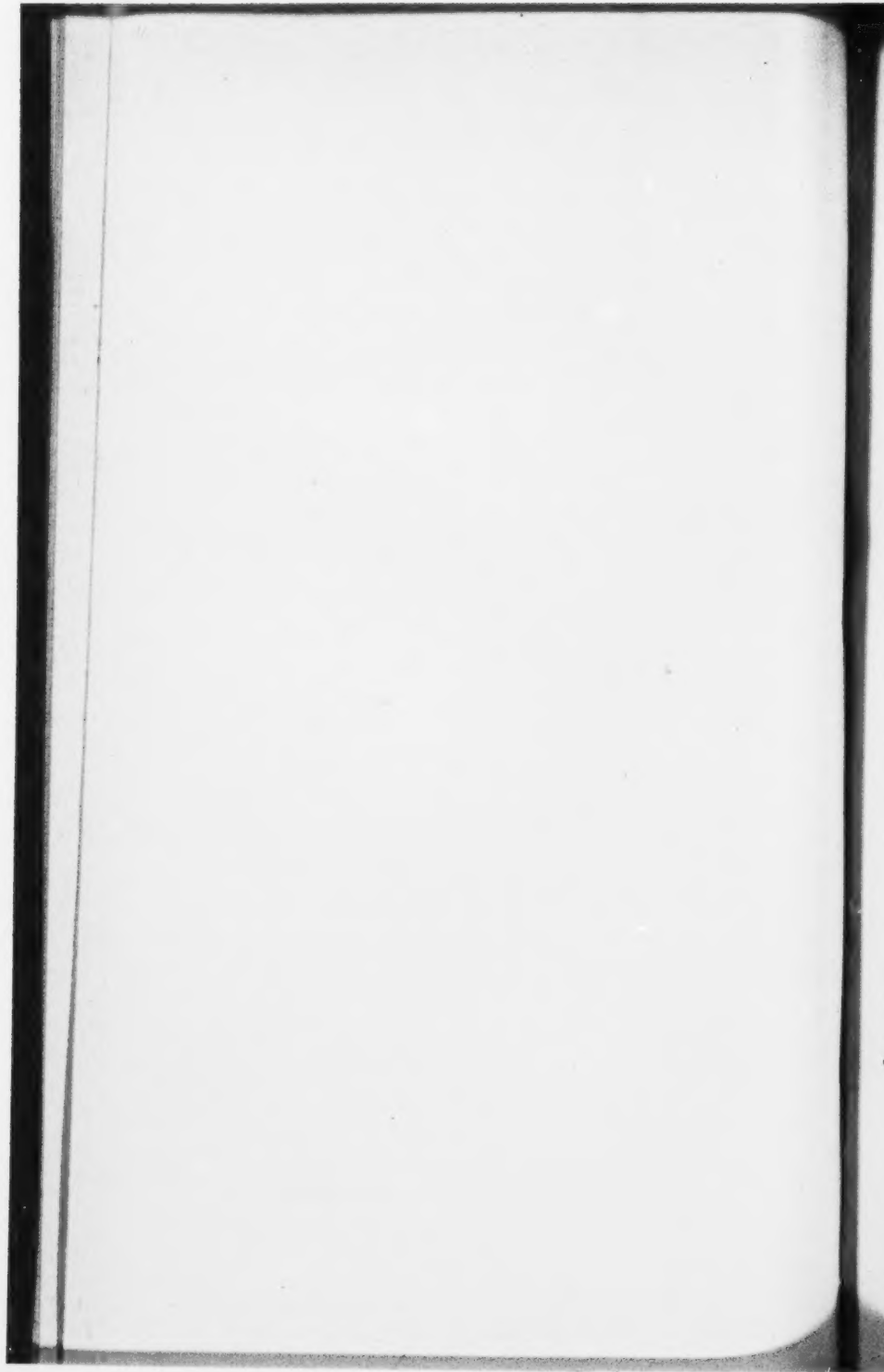
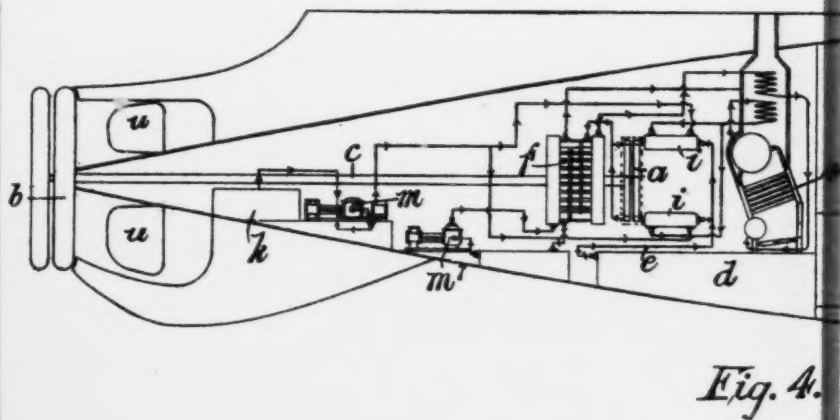
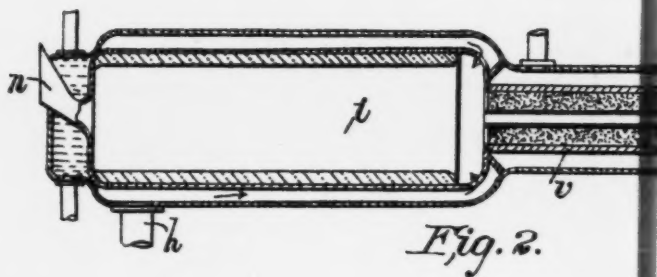
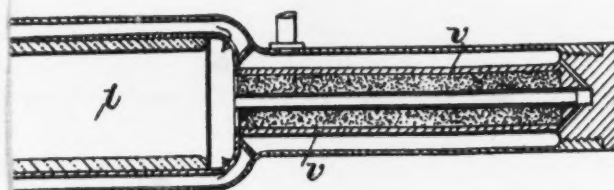
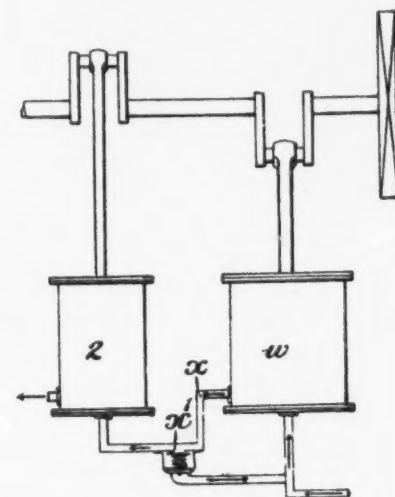
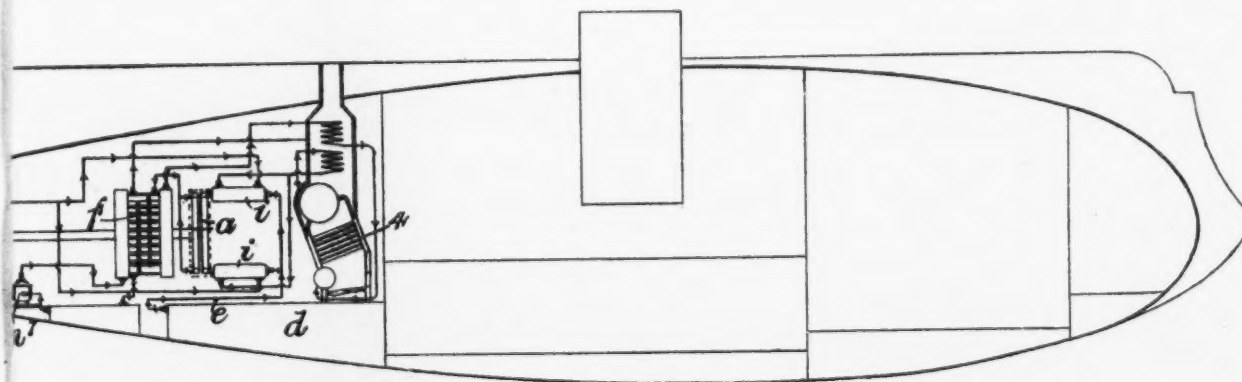


Fig. 1a



(2nd Edition)



*Fig. 2.**Fig. 3.**Fig. 4.*



6. In a turbine driven automotor, supplying the working fluid by the burning of self-oxydising combustible such as slow burning powder, the gases from which are expanded through nozzles and form the working fluid, substantially as and for the purpose described.

7. In an automotor such as claimed in Claim 6, adding inert matter to form part of the working fluid, substantially as and for the purpose described.

8. In automotors such as previously claimed, the use of a generator for one or more of the elements forming the working fluid, substantially as and for the purpose described.

9. My improvements in the driving of automotors, substantially as hereinbefore described.

Dated this 27th day of February, 1905.

MARKS & CLERK,

18, *Southampton Buildings, London, W. C.*

13, *Temple Street, Birmingham, and 30 Cross
Street, Manchester, Agents.*

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd. [Wt. 35—125/7/1914.]

(Here follow diagrams marked pages 813 and 815.)

819 & 820

DEFENDANT'S EXHIBIT 108.

United States Patent Office.

Ludwig Obry, of Trieste, Austria-Hungary, Assignor to Whitehead & Co., of Fiume, Austria-Hungary.

Gyroscope for Torpedo-Steering Mechanism.

Specification Forming Part of Letters Patent No. 648,878. Dated May 1, 1900.

Application Filed December 20, 1898. Serial No. 699,794. (No Model.)

To all whom it may concern:

Be it known that I Ludwig Obry, engineer, a citizen of the Empire of Austria-Hungary, residing at Trieste, Austria-Hungary, have invented certain new and useful Implements in and Connected with Gyroscopes or Gyroscopic Steering Mechanism for Torpedoes, of which the following is a full, clear, and exact description.

This invention relates to steering apparatus for torpedoes as described in the specification of Obry's patent, No. 562,235, and more particularly to the gyroscope forming part of the said apparatus, but is applicable also to gyroscopic mechanism for other purposes.

The accompanying drawing is partly a plan and partly a horizontal section of a gyroscope embodying my invention.

As shown by the drawing, the conical ends of the axle r run on balls t , held in adjustable blocks or plugs T , each of the said plugs being screwed radially into the gimbal-ring q and having in its face a cup-shaped cavity adapted to receive the balls.

In order that the plugs T may be held fast after adjustment, the gimbal-ring q is slotted at the right and left of each bore, serving to receive one of the said plugs, and screws v extend across the parts which have been separated by the slots, by means of which screws the said parts may be drawn together after the plugs T have been adjusted.

By this improvement the time during which the heavy mass R continues to revolve, and consequently the time during which the gyroscope remains under control of its steering capacity, is much increased.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination with a gimbal-ring provided at diametrically-opposite points with bores, and being slotted on each side of said bores, of plugs seated in the bores, and having ball-races, a rotatable body R within the ring and having bearing ends projecting into the cavities of the plugs forming the ball-races, balls arranged in said cavities and upon which the bearing ends of body R bear,

No. 648,878.

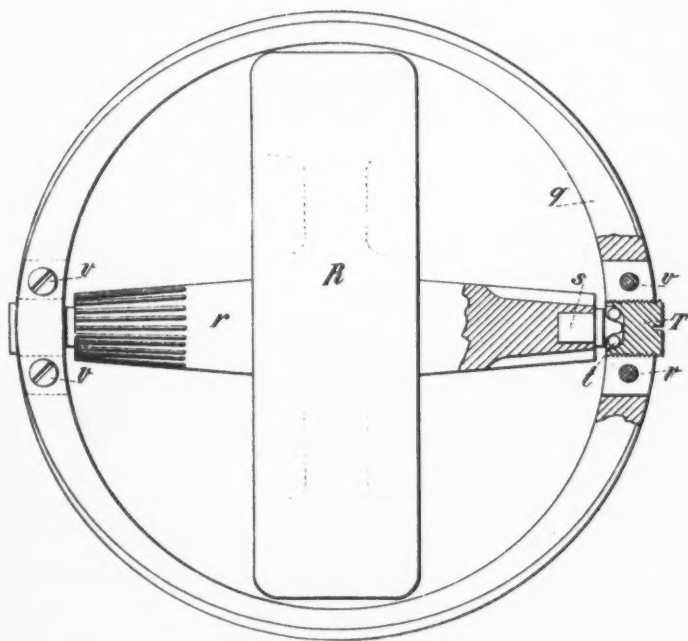
L. OBRY.

Patented May 1, 1900.

GYROSCOPE FOR TORPEDO STEERING MECHANISM

(Application filed Dec. 20, 1900.)

(No Model.)



Witnesses.

J. A. A. A. A.

J. A. A. A.

Inventor.

Ludwig Obry,

By *Hubert A. A. A.*
attorney



and means for clamping the slotted parts of the ring and securing the plugs in position.

In witness whereof I have hereunto set my hand in presence of two witnesses.

LUDWIG OBRY.

Witnesses:

FRANECK BUTTORO,
A. BRUNER.

(Here follows diagram marked page 818.)

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DEFENDANT'S EXHIBIT 109.

(Also Defendant's Exhibit 135.)

United States Patent Office.

Frank M. Leavitt, of New York, N. Y. Assignor to E. W. Bliss Company, of Brooklyn, New York, a Corporation of West Virginia.

Gyroscope Spinning Device.

No. 814,969.

Specification of Letters Patent.

Patented March 13, 1906.

Application Filed June 17, 1905. Serial No. 265,756.

To all whom it may concern:

Be it known that I, Frank M. Leavitt, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Gyroscope Spinning Devices, of which the following is a specification.

In an automobile torpedo having a gyroscopic steering apparatus it is necessary to spin up the gyroscope during the launching of the torpedo while the latter is moving in the launching-tube and to release the spun gyroscope before the torpedo shall have moved far enough to depart from the original direction given it by the launching-tube. This spinning up has heretofore been accomplished in two ways: first, by a spring-motor previously wound, which is tripped automatically during the launching movement, whereupon it exerts its stress to first spin up and then unlock the gyroscope; second, by a turbine or reaction motor to which compressed air is admitted upon the opening of the air-valve to start the engine during launching, whereby the air-jet quickly spins up the gyroscope, whereupon a compressed-air-actuated device acts to unlock the gyroscope. The latter system is set forth in my United States Patents No. 741,683 and 768,291.

The present invention instead of providing a special motor for momentary use in spinning up the gyroscope utilizes for this purpose the main motor or propelling-engine of the torpedo, which is primarily connected to the gyroscope, a means being provided for disconnecting them after a sufficient interval to insure that the gyroscope shall have been spun up to the requisite velocity, whereupon the gyroscope is simulatenously set free.

Figure 1 of the accompanying drawings is a sectional view of the after portion of an automobile torpedo. Fig. 2 is a vertical section,

F. M. LEAVITT.
GYROSCOPE SPINNING DEVICE.

APPLICATION FILED JUNE 17, 1905.

FIG. 1.

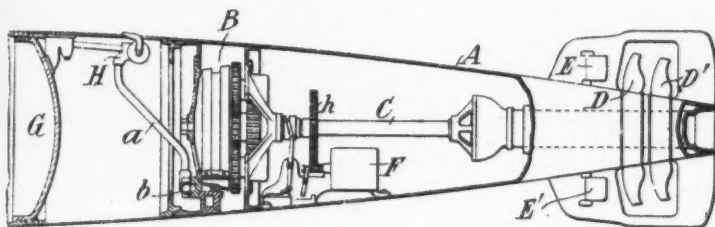


FIG. 2.

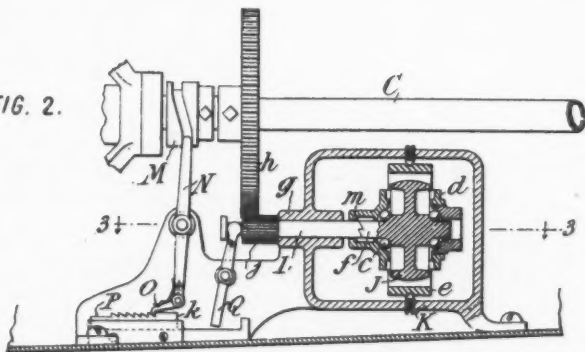
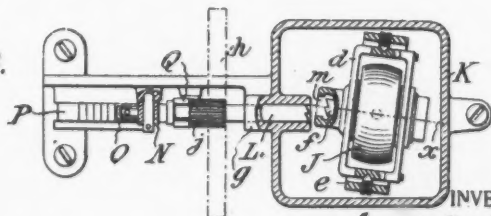


FIG. 3.



WITNESSES:

Fred White
Rene Muine

INVENTOR:

Frank M. Leavitt,

By Attorneys,

Arthur C. Draper & Co.



on a larger scale, of a portion of Fig. 1. Fig 3 is a horizontal section on the line 3 3 in Fig 2.

Referring to the drawings, A designates the shell or hull of the torpedo, of which B is the propelling-engine or motor. C is the propeller-shaft. D and D' are propeller-screws. E, E' are the steering-rudders, and F is the gyroscope or gyroscopic steering apparatus which through any suitable intermediate steering-engine controls these rudders.

In the construction shown the propelling-engine B is a turbine driven by compressed air from the usual compressed-air reservoir, which during the launching movement is admitted by the opening of the starting-valve H through a pipe *a* to the nozzle *b*, from which the jets of air impinge upon the blades of the turbine, the resultant air escaping within the torpedo-shell and discharging through the hollow tail portion of the propeller-shaft. While this turbine-engine is preferable, yet for the purposes of the present invention the usual cylinder-engine or any other suitable motor may be used.

The gyroscopic device F comprises the usual fly-wheel J, hung in gimbal-rings, whereby it is capable of universal movement, so that its axis or rotation may be deflected in any direction. It is shown turning in ball-bearings *c* within a frame *d*, constituting the inner gimbal-ring, and which is pivoted on an axis at right angles to that of the fly-wheel (shown as a horizontal axis in a frame *e*, constituting the outer gimbal-ring, which in turn is pivoted on an axis normally at right angles to both the preceding axes (shown as a vertical axis) to a fixed frame or outer support K, which is shown in an inclosing case or box. While this construction of gyroscope is preferred, any other suitable construction thereof may be used. The gyroscope may be connected in any suitable manner to control a steering-engine or other mechanism for operating the rudders.

For connecting the gyroscope to the propelling-engine in order to spin up the gyroscope a shaft L is geared to the propeller-shaft C and arranged to be detachably coupled to the fly-wheel, preferably by engaging an axial shaft or spindle *f* thereof. Then shaft L turns in a bearing *g*, which may conveniently be carried by the frame K. It is rotated by a gear-wheel *h*, fixed on the shaft C, meshing with a pinion *j* on the shaft L. The shaft L is movable radially in its bearing, and to accommodate this movement the pinion *j* is elongated. This longitudinal movement of the shaft is for disconnecting it from the fly-wheel after spinning up the latter. This movement is imparted by any mechanism which will act only after a certain time has elapsed to enable the propelling-engine to have attained such speed as to spin up the gyroscope to

(Here follows diagram marked page 822.)

824 the requisite velocity. A suitable velocity for a gyroscope of the usual dimensions is ten thousand revolutions per minute.

A suitable mechanism for accomplishing this result is that shown, comprising a cam M, fixed on the shaft C and acting to vibrate a lever N, which carries a pawl O, which engages teeth in a slide P, so that the latter is advanced step by step, and after a predetermined movement its shoulder *k* strikes a lever Q, the opposite arm of which is forked and engages a groove in the shaft L, whereby this shaft is quickly moved endwise, so as to uncouple it from the fly-wheel.

It is requisite that the inner frame or ring *d* of the gyroscope be locked fast during the spinning-up operation and thereupon unlocked or released, so as to leave the gyroscope free to turn in any direction. This locking and unlocking may be variously accomplished. A simple and effective way is to utilize the shaft L as the locking means, so that its endwise movement shall release the gyroscope. For this purpose the ring *d* has a prolongation or neck *n*, which embraces the shaft L during the spinning-up operation, whereby the correct alignment of the fly-wheel axis is assured. On the endwise movement of the shaft L it first disengages itself from the fly-wheel, so as to set the latter free, and immediately thereafter withdraws from the bearing portion *m* of the ring *d*, whereby the gyroscope is released. Fig. 3 shows this released condition, whereby the gyroscope is free to turn, and shows that a relative movement in a horizontal plane has occurred between the torpedo and gyroscope, whereby the gyroscope-axis *x* is deflected out of line with the shaft L, as occurs during the run of the torpedo. After this unlocking movement and during the remaining run of the torpedo the shaft L turns idly.

In order to prepare the mechanism for a new operation, it is necessary to lift the pawl O and move the slide P to its starting-point, then to bring the gyroscope-ring *d*, with its bearing *m*, in line with the shaft L and push this shaft endwise into this bearing until its end engages with the spindle *f*.

During the spinning up the motion is a gradual acceleration due to the inertia of the moving parts of the engine or motor, so that the gyroscope is protected from injury which might occur from a too sudden movement.

The mechanical construction may be greatly varied without departing from the essentials of this invention.

What I claim is—

1. The combination of a propelling-engine, a gyroscope, means for connecting them whereby to spin up the gyroscope upon the starting of the engine, and means for disconnecting them after a predetermined interval.
2. In an automobile torpedo, a propelling-engine and shaft, a gyroscope, a geared connection between said shaft and the gyroscope for spinning up the gyroscope upon the starting of the engine, and means for disconnecting them after a predetermined interval.
3. In an automobile torpedo, a gyroscope, and a connection be-

tween it and the propelling-engine, whereby to spin up the gyroscope upon the starting of the engine, and means for disconnecting them and for releasing the gyroscope after a predetermined interval.

4. The combination of a propelling-engine, a gyroscope, a longitudinally-movable shaft geared to the engine and adapted to engage the gyroscope fly-wheel, and means for displacing this shaft after a predetermined number of revolutions to disconnect it from said fly-wheel.

5. The combination of a propelling-engine, a gyroscope, a longitudinally-movable shaft geared to the engine and adapted to engage the gyroscope fly-wheel, the inner ring of the gyroscope adapted to be engaged by said shaft, whereby it holds this ring immovable during spinning, and means for displacing said shaft to disconnect it from said inner ring to set the gyroscope free.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

ARTHUR C. FRASER,
THEODORE T. SNELL.

829

DEFENDANT'S EXHIBIT 110.

United States Patent Office.

John L. Lay, of Buffalo, New York.

Improvement in Torpedo-Boats.

*Specification Forming Part of Letters Patent No. 211,303, Dated
January 14, 1879; Application Filed July 17, 1878.*

To all whom it may concern:

Be it known that I, John L. Lay, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Torpedo Vessels; and I do hereby declare that the following is a full and accurate description thereof, reference being had to the accompanying drawings, forming a part of this specification.

The said invention is designed to provide the means whereby a boat or vessel charged with suitable explosive materials—that is to say, a torpedo boat—may be propelled by machinery contained therein, and at the same time may be kept fully under the control or management of an operator or staff of operators at a station on land or on board a ship or floating battery. After being launched from such station, vessel, or structure, the said torpedo-boat may be kept under observation and accurately guided or directed to an iron-clad ship or other object of attack, and may be fired or discharged at any desired moment, or may be caused to return to its station without being fired.

The manner in which I carry my said invention into practice is clearly illustrated in the accompanying drawings, which I will now proceed to describe.

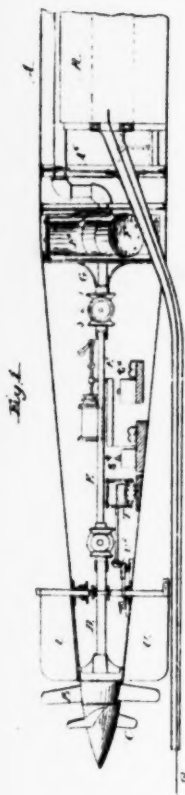
(Here follow diagrams marked pages 826 and 828.)

Referring to the drawings, Figure 1 is a longitudinal vertical section (broken in two parts on account of the size of the drawing) of a torpedo-boat constructed and provided with controlling apparatus, and with means for propelling it by ammoniacal gas, according to my invention. Fig. 2 is a horizontal longitudinal section of the same, similarly broken. Fig. 3 is a horizontal longitudinal section, similarly broken, showing the same provided with means for driving it by carbonic-acid gas. Fig. 4 is a transverse section on the line $x x$, Fig. 1. Fig. 5 is a transverse section on the line $y y$, Fig. 1. Figs. 6 and 7 are modifications of certain parts hereinafter described.

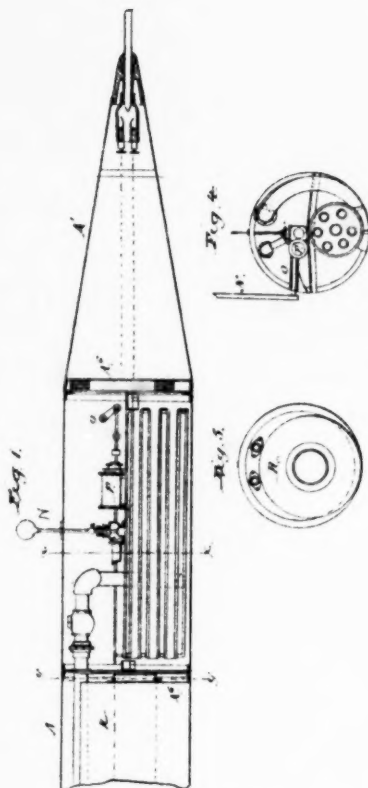
J. L. LAY.
Torpedo-Boat

No. 211,303.

Patented Jan. 14, 1879.



Attest:
J. R. Brooks
J. R. Gault



Inventor:
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J. L. LAY.
Torpedo-Boat.

No. 211,303.

Patented Jan. 14, 1879.

Fig 2b.

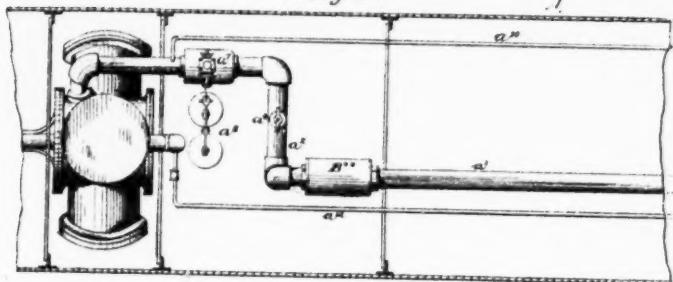


Fig 2b.

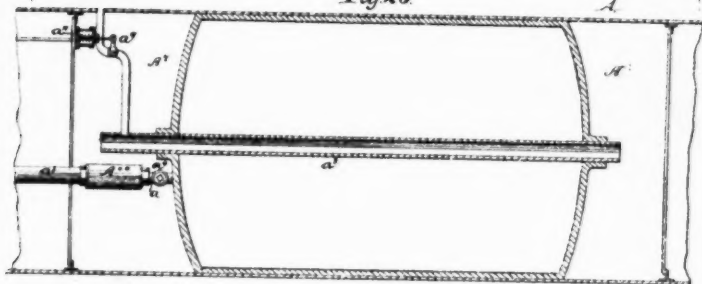
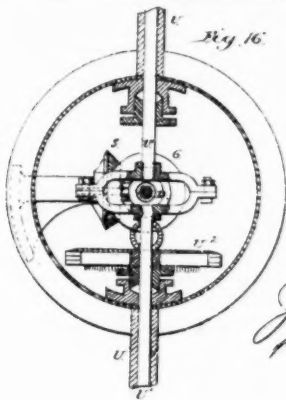


Fig 16.



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Fig. 8 is a longitudinal section of the stem of the said torpedo boat, showing the mechanism for firing the same. Fig. 9 is a horizontal longitudinal section of a portion of the bows, showing the same provided with adjustable side wings or horizontal rudders. Fig. 10 is a vertical longitudinal section of the same. Fig. 11 is a transverse section on the line $q\ q$, Fig. 9. Figs. 12 and 13 are side views of the bow or stem of a torpedo-boat with a detaching magazine or torpedo, the same being shown in two positions. Fig. 14 is a longitudinal section of the stern of my torpedo-boat, showing the same with two propellers and steering apparatus. Fig. 15 is a horizontal section of the same. Fig. 16 is a transverse section on the line $x' x'$, Fig. 14. Fig. 17 is an end view of Fig. 12. Fig. 18 is a transverse section on the line $Z\ Z$, Fig. 12. Fig. 19 is a longitudinal section of the drum or reel on which the cable is coiled in the said torpedo-boat. Fig. 20 is an end view of the same. Fig. 21 is a transverse section of the barrel or core of the said drum. Fig. 22 shows a side view and transverse section of a thimble through which the said cable passes in paying it out. Figs. 23, 24, and 25 are views of a cable-reel and core slightly modified in construction.

Like letters indicate the same parts throughout these drawings.

A is the hull or body of the boat, which has conical ends $A^1 A^2$, and is formed of thin plate iron or steel or other suitable metal. This hull is divided into sections or compartments for the various purposes hereinafter described. All of these compartments are separated from each other by air-tight bulk-heads A^3 .

My torpedo-boat may be provided with a single screw-propeller, or with a double screw, or two screws or propellers, as shown in Figs. 1, 2, 3, 14, and 15. The propellers B C revolve in opposite directions. The shaft D of the propeller B is hollow or tubular, and the shaft E of the other propeller, C, passes through the same. The said screws or propellers B C are actuated by an engine. (Shown at F, Figs. 1, 2, and 3.) In the boat shown in Fig. 3 the engine is operated by the expansive force of carbonic-acid gas, while in the boat shown in Figs. 1 and 2 it is driven by ammoniacal gas; or I may use compressed air, or any other fluid which will be an equivalent for such gases. The connection of the engine with the two propeller shafts is effected by two sets of bevel-gearing, or by other suitable means.

The said engine has a boss or projection, G, on which is fixed a bevel-wheel, 1. The engine-shaft passes through this boss and fixed wheel, and is provided with a stud or finger fixed on it, and which carries a similar wheel, 2, that rotates freely on the said stud in gear with the wheel 1, and also with a similar wheel, 3, fixed on the screw shaft E. In this arrangement of gearing the engine-shaft carries the wheel 2 around the fixed wheel 1, and thereby imparts rotation to the wheel 3 and shaft E with an increase of velocity of the screw-shaft in the ratio of two to one.

The shaft E also carries a bevel-wheel, 4, which gears with a similar wheel, 5, fitted to turn freely on a stud or shaft fixed in any convenient manner to the side of the boat. This wheel 5 also gears with a wheel, 6, on the tubular or sleeve shaft D, and thereby im-

parts motion to the same and the propeller B in a direction opposite to that of the revolution of the propeller C. This arrangement of gearing affords the means for obtaining very advantageously the required velocity of the two propellers in opposite directions.

The said boat or vessel is provided with a double set of side wings or horizontal rudders, H—two forward and two aft. These side wings or rudders are mounted on shafts or spindles I, passing transversely through the boat, as shown in Figs. 9, 10, 11. Attached to the shaft I are crank-arms J, which have slots for the reception of the ends of the cross-head K. The boss of this cross-head forms a nut, through which passes the vertical screw L, supported and kept from endwise movement by the bearings L¹ L²; and by turning this screw to the right or left the cross-head K and shaft I are adjusted to set the said wings H vertically to any desired angle—that is to say, they may be set to escape a horizontal position—or more or less inclined in the proper direction, to cause the submerging of the boat by the action of the water on the said wings as the boat moves forward.

This screw L is operated from the outside of the boat by a key or wrench applied to the end of the screw L. These side wings or rudders are adjusted to the required angle for causing the necessary submergence, or partial submergence, of the boat before starting or leaving the station.

Two guide-rods, N, one aft and one forward, project up from the said vessel, to enable the operator to determine its position at any part of its journey, and in case of a night attack these rods are provided with lights; but as I have another application for sight-rods pending in the Patent Office, I do not deem it necessary to describe and claim them in this application.

In some instances I may employ hollow fixed rods or tubes, with balls of india-rubber or other like material at the upper ends of the same. These balls can be inflated with gas from the reservoir by means of a suitable valve, to render them visible to the operator, and when no longer required can be caused to collapse by exhausting the gas from them; or the pipes may be so short as not to project above the water, and open at top, or closed by valves opening outward, and a blast of air or gas from the flask will throw up a jet of water above these tubes, thus indicating the position of the boat.

The medium of communication between the said torpedo-boat and the land or other station occupied by the operator, and whereby the boat is started, stopped, and steered, and has her position ascertained, is an electric cable, Q, which is carried in the boat and paid out as the boat progresses.

The cable is preferably coiled on a reel or in a coil arranged longitudinally in one of the air-tight compartments of the boat, and passes out through a tube which projects beyond the rudder and propeller, so as not to be caught in or fouled by the propeller. One end of this cable is connected to a key-board at the station on shore or on board of the ship or other structure from which the torpedo-boats are controlled. This key-board is provided with a suitable battery or other means for generating the electric current. The

said cable is composed of several wires, each of which is insulated from the others. One of these wires is connected with the mechanism for starting and stopping the boat, one is connected with the steering apparatus, one serves for indicating to the operator at all times the exact position of the rudder, one is connected with mechanism for elevating and depressing the said guide-rods, and one serves for firing the charge in the magazine.

The motive power for effecting the necessary movements of the mechanism or apparatus in performing the above operations is obtained from the aforesaid engines, which are provided with suitable valves arranged in combination with electro-magnets, shunts, and the devices connected with the said wires of the cable, as hereinafter set forth.

For placing the cable Q in the form of a coil in the said chamber, I prefer to use a reel constructed as shown in Figs. 19, 20, and 21—that is to say, it is provided with an inner core or barrel, R¹, and two flanges, R². The said flanges are connected or tied together at or near their periphery by rods or bars R³, provided with hooks, which take hold of the rims of the flanges R².

The hook R⁴, at one end of each rod, is loose, in order that it may be adjusted to fit over the said rim, and, when properly placed thereon, it is tightened on the said rim to bind the ends of the coil by a screw-nut, as shown.

The coil of cable is covered by a sheath, R⁴.

The core or barrel R¹ is divided longitudinally into two or more parts, to permit it to be removed from the coil. While the cable is being coiled on the reel the said core and end flanges are secured by disks R⁶, provided with necks or trunnions R⁷. The said trunnions rest in bearings, and the reel turns therein while the
831 cable is being coiled. When the cable is coiled on the said reel, the rod and end pieces are removed. The core is then drawn out piece by piece.

The thimble or ring R⁵, Fig. 22, is placed inside the end of the coil for the cable to pass through, and the inner end of the cable is taken through the ring, the said cable being thus paid out by commencing at the inside of the coil.

Fig. 23 is a perspective view of a modified form of reel, partly full of a coil of cable, with the outside securing-rods in place.

Fig. 24 is a view of this core, with the side plates secured to the end thimbles by screws.

Fig. 25 is a section of the core, with the thimbles held together by a central rod passing through them.

The coil is wound on the core, beginning at one end, and after a few turns of the coil about the core the screws holding the side plates may be removed, when the coil may be completed, the turns of the cable holding the side plates of this core in place. Other forms of collapsible core may be readily devised.

I may use an oval or flattened coil instead of a cylindrical one, by winding the cable on a core of suitable form. The oval or flattened coil may then be dropped into the compartment of the boat,

the wires, pipes, &c., leading through the boat passing over the flattened side of the coil.

It will be observed that I place my coil or reel longitudinally in the boat, so that the turns of the cable surround the central axial line of the boat, and that I pay out the cable from the inside of the coil. Both these features I deem of much importance.

The thimble which I place in the end of the reel-head after the coil is wound and the core withdrawn has rounded edges, surrounding the central aperture, and the aperture is somewhat smaller than that in the reel-head; or one reel-head may be made with a central aperture smaller than the core, (which must then be withdrawn from the other end,) and the edges of the head may be rounded to allow the cable to run easily out of the reel.

The rudder is operated and controlled by means of a small auxiliary engine, (shown at T, Figs. 1 and 2,) which is started, stopped, and reversed by the electric current conducted through the said cable in connection with magnets attached directly to a valve forming part of the said engine. This valve is so actuated by the said magnets that when the current passes in one direction the engine will move the rudder to starboard, and when the current acts in the opposite direction it will turn the rudder to port.

The steering apparatus is most clearly shown in Figs. 14, 15, and 16. In these figures I have shown the boat provided with a double rudder or two rudders, one below and one above the boat, and both fixed to one shaft or stock, U¹, or two shafts united by a yoke, through which the propeller-shaft passes; but it will be readily understood that I may, if desired, use only one rudder.

On the rudder stock U¹ is an arc or sector, U², which is connected by worm or bevel gearing with the engine-shaft T'. This arc or sector U² is provided with metallic pins or projections on its under side; and below this arc, and in the path of the same, I arrange a spring, U³. When the rudders move, these teeth or points come in contact with the aforesaid spring, thereby closing the electric circuit.

On both sides of the rudder-stock U¹, I arrange a spring or arm, U⁴, which, in its normal position, rests against a contact point or post, U⁵, and these arms thereby complete the electric circuit; but this circuit is also completed through a resistance coil. When the rudders U are hard a-port or hard a-starboard, the end of the arc or segment U², which is furnished with insulating-points U⁶, will be brought into contact with the corresponding spring U⁴, and will push the same out of contact with the said point or post U⁵, and can then move no farther in that direction. This position of the rudder is indicated on the keyboard through the electric cable by a suitable indicator.

In Fig. 7 I have shown a modification of my steering apparatus, in which a three armed lever is fixed on the rudder-post, and is connected directly to the pistons of two engine-cylinders, U⁷, Fig. 3, by rods U⁸. The arm U⁹ of this lever is provided with a friction-roller, which works upon the V-spring U¹⁰. The latter is so formed that when the rudder is, by the action of the said pistons, moved

either to port or starboard it tends to restore the said rudder to its central position by bringing the said friction roller over either of its inclined surfaces into the central angle of the said spring, as shown. Or the spring U^{10} may be arranged at one side, and the central arm of the yoke dispensed with, as in Fig. 3.

The mechanism for firing the charge in the magazine A^1 is most clearly shown in Fig. 8, and operates as follows: Projecting from the front-extremity or stem of the boat is a rod or pin, V , which extends through a suitable packing-box, W , into the said magazine or charge-chamber. When the boat strikes an object the said rod is forced inward into contact with the springs or points X , thereby closing an electrical circuit and igniting a cartridge (shown at Y) in the magazine. The charge in the magazine can also be fired at any moment by the operator on shore closing a circuit on the key-board, and thereby cutting out one of two resistance coils placed in the circuit to prevent accidental or premature discharge—that is to say, there are two resistance coils.

The battery is not sufficiently powerful to fire through both resistance coils at the same time. When the boat strikes an object the resistance-coil in the magazine is cut out by the driving inward of the rod V , as above described. The battery then fires through the one on the key-board. On the other hand, if the operator desires to fire the torpedo-boat before she touches the object of
832 attack, he manipulates the switch to cut out the coil in the key-board, the charge then being fired through the coil in the magazine. This arrangement of the two resistance-coils is very effectual in preventing accidents.

In order that the said torpedo-boat may be provided with material for maintaining the action of the motor-engines for a sufficient time, it is sometimes necessary that the reservoir or vessel containing the gas or fluid from which the motive power is generated should contain such gas or fluid under a pressure very much higher than that under which the same can be used in the engines. Therefore it is necessary to provide means whereby this pressure can be reduced in its passage from the said reservoir to the engine. For this purpose I employ a valve or valves so arranged as to greatly reduce the pressure of the gas as it passes to the engine from what it is normally in the flask or holder containing the gas under pressure or in liquid form.

In Fig. 26, which is a horizontal section broken in halves, I have shown a convenient arrangement of the pipes and valves in my improved torpedo-boat, the other parts of the apparatus being omitted to permit the said pipes and valves to be clearly seen. In this figure I have shown the reducing-valves last above described both arranged in the gas-pipes between the reservoir and the engines.

The valve A^{**} first reduces the pressure from the very high degree in which it exists in the reservoir and pipe a to a comparatively moderate pressure on the pipe a^1 , and the valve B^{**} admits the gas, still further reduced in pressure, from the pipe a^1 to the pipe a^2 , from which it passes to the throttle-valve to the engine. The pipe a^3 , extending through the flask or reservoir, provides communication between the water-spaces A^7 at the ends of the same.

a^* is a valve for closing the pipe a , and which is opened from the outside of the boat before the same is started. a^6 is a safety-valve for relieving the engine and pipe a^2 . a^7 shows the position of the aforesaid throttle-valve, which is controlled by the operator through the cable and the magnets a^5 . a^9 is a small valve for admitting water to the spaces A^7 to compensate for the gas taken from the reservoir. a^{10} is a pipe, which conveys gas from the pipe between the engine and throttle-valve to a small cylinder, a^{11} . This cylinder is provided with a spring-piston, connected by a lever to the said valve a^9 .

When the throttle-valve is open the gas overcomes the spring of the said piston and opens the valve a^9 , thereby admitting water to the space A^7 . When the throttle-valve is closed the spring forces back the piston and closes the valve a^9 .

a^{12} is a pipe for permitting the escape of air from the spaces A^7 into the exhaust-pipe of the engine.

When ammoniacal gas is used ammonia in a liquid state is carried in a cylinder containing a series of tubes, and which is surrounded with water. The gas having exerted its power in the engine is exhausted into this water surrounding the aforesaid cylinder, and it is absorbed by the water, and during the absorption heat is developed, which is imparted to the ammoniacal gas in the cylinder, thereby maintaining a uniform pressure.

In Fig. 6 I have shown in this water-compartment a small fan or propeller, driven by a rotary engine, for the purpose of keeping the water in agitation, and thereby insuring this desired uniformity of temperature.

In some instances I make the magazine detachable from the hull of the boat, so that on striking an object it will descend or drop down in the water before exploding.

This modification of my invention is illustrated in Figs. 12, 13, 17, and 18. The magazine A^1 is attached at its lower side to the boat by a chain or other suitable connection. At its upper edge it is held by a rod, as shown in Fig. 12. This rod is fitted to slide in dovetailed bearings, as shown at Bx , and when this magazine is in its place on the boat the said rod is engaged with a catch or stop, c^x ; but when the said rod is driven against any object it is forced back and released from the said catch or stop, and the magazine then drops, as in Fig. 13, and is fired.

To effect the firing, I prefer to use a ball, Dx , placed in a tube containing two springs or plates, Ex , and arranged in an upwardly-inclined position, as shown in Fig. 12, one of the said springs being connected with the cable, and the other with a wire that passes through the cartridge to the ground. While the magazine is in the position shown in Fig. 12 the circuit is incomplete; but when the magazine drops, the said ball falls into the position shown in Fig. 13. The circuit is then completed and the magazine is fired.

The electrical or electro-magnetic apparatus for generating, directing, and controlling the currents, whereby the above-described operations are effected, may be of any suitable kind.

For operating and controlling the above-described steering apparatus, and indicating the position of the rudder to the operator

on shore, I use the following devices, in combination with the pole-changers on the key-board. These pole-changers are geared together by insulated toothed wheels, which are fixed on the spindles or axles of the said pole-changers so that the latter work accurately together and maintain the same relative positions to each other. One pole-changer is connected by one of the said insulated cable-wires with a shunt on board the boat, which shunt is connected with a set of magnets arranged in combination with the valve of the engine that drives the steering apparatus, and which valve is reversed or opened and closed by the reversal of the currents through the said magnets, as above described, and the said engine moves the

833 rudder to port or starboard at the will of the operator. But in order that the operator may know the exact position of the rudder at any moment, I employ the device hereinbefore described, consisting of a series of pins or projections fixed on an arc or other portion of the rudder-stock, and arranged in combination with an insulated spring projecting into the path of the said series of pins. This spring is connected by one of the cable-wires with a pole-changer on the key-board, which is geared with and moves in unison with the other pole-changer, so that the electric current that controls the steering engine and the current that returns the indication of the rudder's position will both be reversed simultaneously. A separate battery is connected with the index on the said key-board, whereby a constant current is maintained between this index and the indicating apparatus on the boat. The current passing from the said spring to the shore is made to indicate the position of the rudder by the index on the key-board. Now, it will be obvious that when the rudder is turned in either direction, the pins on the sector U^2 will come successively in contact with the spring U^3 , and at each contact and separation the circuit will be made and broken, and an impulse will be transmitted through the cable, whereby a corresponding movement will be transmitted to the said index finger or pointer on the key-board. A switch on the key-board is connected with another of the said insulated wires of the cable, which forms the circuit to the firing mechanism of the torpedo or magazine which includes the aforesaid two resistance-coils. By adjusting this switch the operator completes the circuit through the two resistance-coils, and then, but not till then, the charge can be exploded either by the operator or by the action of the firing pin or rod, when the same is driven in and cuts out the other resistance coil, as above described.

By referring to Fig. 8, the arrangement of the resistance coil and connecting wires on the boat may be fully understood. The resistance-coil X' is connected by the wires 7 8 to the binding-screws 9 10, which are insulated from the case or box Z , but are connected with the springs or points X . The wire 11 from the key-board battery is connected to the screw 9, and the wire 12 extends from the screw 10 through the cartridge Y to the ground. Now, when the operator, as aforesaid, cuts out the resistance coil on shore by actuating the switch on the key-board, the current from the battery is sufficiently powerful to fire the said cartridge through the resistance coil X' , and the operator can thus fire the charge at any moment;

or he can await the contact of the boat with the ship or other structure to be attacked, when the charge will be fired automatically by the driving in of the rod V, as above described. When this rod is driven so that its inner extremity or point, V', is in contact with the springs X the circuit is completed through the wire 11, springs X, the point V', and wire 12, and the charge is fired.

What I claim as my invention is—

1. The two propellers, one in rear of the other, the tubular propeller shaft, the engine, and the system of gearing, all in combination, so that the screw-propellers move in opposite directions and with different velocities, as set forth.

2. A torpedo-boat having side wings or diving rudders, and mechanism, substantially as described, for adjusting said rudders to any desired angle prior to launching the boat and retaining them in that position, as set forth.

3. A pair of diving wings connected to a screw shaft, one end of which projects through the side of the boat, as shown.

4. The combination, with the sight-rods of a torpedo boat, of an elastic globe or target, which is inflated from the gas-flask, as shown and described.

5. The cable reel having a detachable core, on which the cable is wound, which core is removed to permit the paying out of the cable from the inside of the coil, as set forth.

6. A skeleton cable-reel having end plates and side clamps and a round-edge delivery-orifice for the cable, as described.

7. The combination of the reel-plate R² and thimble R⁵, as set forth.

8. A collapsible core, constructed substantially as described, in combination with the end plates and holding-rods of a reel, as set forth.

9. The combination of the reel ends R², having central apertures, with the clamping-rods R³, for retaining a coil of cable.

10. The collapsible core of the cable-reel, consisting, essentially, of the side plates, R¹, end plates, R⁶, or equivalent devices, to retain the end plates and side plates in their relative position.

11. The core of the cable-reel, consisting of side plates and end plates provided with trunnions, in combination with the end plates, R² R², of a cable-reel, all as set forth.

12. The combination of a skeleton reel for holding the cable, said reel having end plates and retaining rods, with a torpedo-boat, when said reel is placed longitudinally of the boat in a compartment thereof, so as to pay out the coil of cable from the inside, as set forth.

13. The combination of the rudder and the electric indicator, to indicate the position of the rudder to the operator, as set forth.

14. A rudder stock or head provided with projecting pins, which, in the movement of the rudder, serves to open and close the electric circuit and indicate the position of the rudder through suitable mechanism, substantially as described.

15. The combination of sector U² on the rudder stock, its connecting and projecting pins, the spring U³ and its connecting electric

wires, and a suitable indicating device at the operating station, whereby the position of the rudder is indicated to the operator.

16. The combination of the rudder and the engine by mechanism substantially as described, whereby the operator is enabled
834 to control the rudder and engine by a single electric circuit, substantially as set forth.

17. The combination, with the rudder-yoke, of safety-springs and resistance coils and wires connecting with the engine, as set forth.

18. The combination of the rudder-yoke or its equivalent, the electrical indicating device, and the safety-springs and wires connecting to the rudder-engine, whereby the engine is stopped automatically when it reaches its extreme position.

19. The combination of sector U^2 on the rudder-stock, having insulated points, the safety-springs, the connecting electric wires, and the magnets which control the rudder-engine, whereby the position of the rudder is indicated on the key-board by the electric current.

20. The combination, in a torpedo-boat, of a gas-engine, a compensating water-tank, and an automatic valve to control the admission of water to the tank, substantially as set forth.

21. A gas containing flask, a pipe leading from this flask to the engine, and a pipe leading to a valve which controls the admission of water to the water compartment, so that this water valve is opened when the engine is in motion and closed when the engine stops, as set forth.

22. In combination, the gas flask, pipes leading from the flask to the engine, a pipe connecting the engine to a cylinder which controls the inlet-valve, and the water-inlet valve and its pipe, all substantially as set forth.

23. The combination of the gas-pipe a^2 , the throttle-valve operated by magnets a^5 , gas-pipe a^{10} , and water-inlet valve a^9 , substantially as described.

24. A torpedo-boat having the charge or magazine contained in a separate detachable section at the bow, which section completes and forms part of the boat proper.

25. The detachable prow of the boat, the retaining-clasp, and the projecting rod which releases the prow, all in combination, as set forth.

26. The combination of the firing-rod with the electric-current wires, whereby the circuit is completed and the torpedo fired by the electric spark on contact with an obstacle.

27. The combination of the firing-rod, the circuit-wires and their projections X , and the resistance-coil X' .

28. The combination of two resistance-coils and connecting-wires and a firing-rod, arranged as described, so that the contact of the firing-rod with an obstacle serves to cut out one of the resistance-coils and fire the charge, as set forth.

29. The combination, with the ammoniacal-gas engine of a torpedo-boat, of a water-compartment to absorb the gas after use and an agitator to accelerate absorption.

30. A rudder-shaft projecting above and below the hull, and collared so as to pass round the propeller-shaft, as shown in Fig. 16.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN L. LAY.

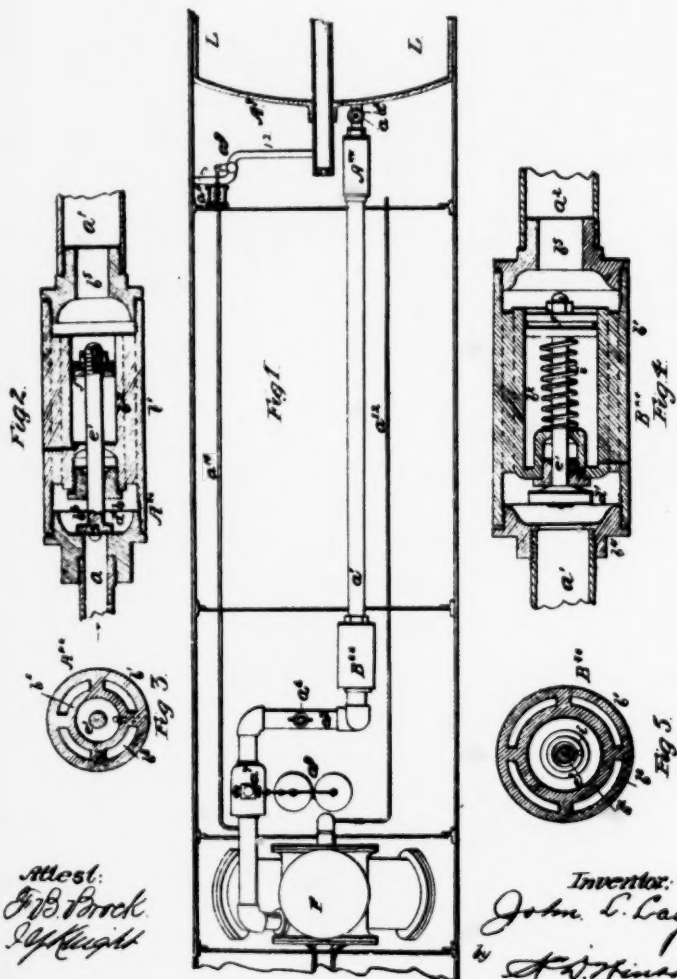
Witnesses:

LEWIS SANDERSON.
ROWLAND GEO. BROWN.

J. L. LAY.
Valves for Torpedo-Boats.

No. 217,120.

Patented July 1, 1879.



Attest:
J. B. Perck
J. H. Knight

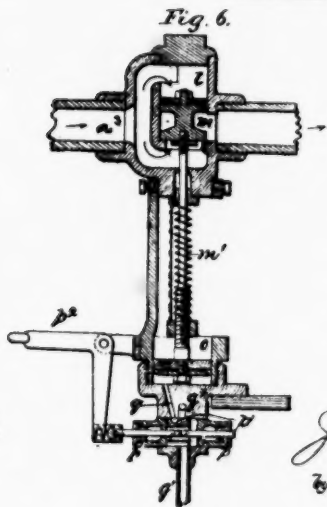
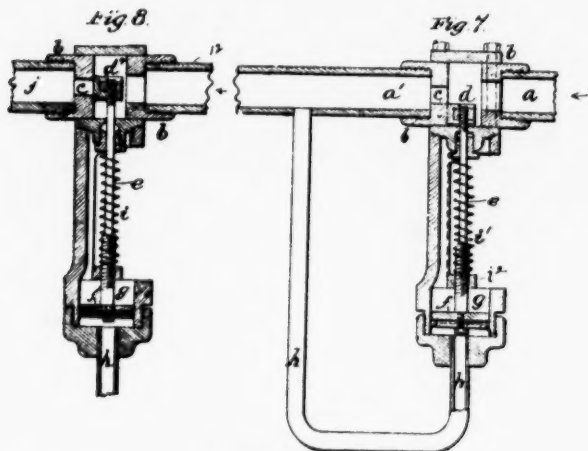
Inventor:
John L. Lay
by H. W. Hinman
Atty.



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H. O. Hinton
Atty



839

DEFENDANT'S EXHIBIT 111.

United States Patent Office.

John L. Lay, of Buffalo, New York.

Improvement in Valves for Torpedo-Boats.

Specification Forming Part of Letters Patent No. 217,120, Dated July 1, 1879; application filed June 5, 1879.

To All Whom it May Concern:

Be it known that I, John L. Lay, of Buffalo, New York, temporarily residing at St. Petersburg, Russia, have invented certain new and useful Improvements in Valves for Torpedo-Boats and other Purposes, of which the following is a specification.

My present invention relates to certain improvements in the internal mechanism of submarine torpedo-boats, of the class that are guided and controlled by an operator outside the boat through the medium of electric wires or cables, but are propelled by an engine on board by means of condensed gas stored in a suitable reservoir. Such vessels are shown and described, in whole or in part, in two patents granted to me in December, 1877, and in three patents granted January 14, 1879, and in other pending applications in the Patent Office, to which reference is made, to show the general construction of such a vessel as I design my present improvement to be applied to.

The specific devices for which I desire to secure protection in the present application are the valves and valve-connections, which enable me to use carbonic-acid gas, ammoniacal gas, condensed air under high pressure, or similar expansive gases, for the propulsion of a submarine vessel.

It is well known that the rapid expansion of gases under pressure has a tendency to produce such a degree of cold (or absorption of heat) as to congeal any moisture in its neighborhood, and even to congeal the gas itself, when it is compressed into liquid form. It is in part to overcome this tendency to freezing, and in part to reduce the high pressure in the reservoir to such a degree as will economize it, and work the engine only at a moderate pressure, that I have devised the present system of valves, which I will now proceed to describe.

The features which I believe to be new with me are hereinafter pointed out in the claims.

(Here follow diagram marked pages 836 & 838.)

Figure 1 is a section of a portion of a torpedo-boat, showing the arrangement of pipes and valves between the reservoir and the engine. Fig. 2 is a longitudinal, and Fig. 3 a cross, section of a valve which may be used at A**, Fig. 1. Figs. 4 and 5 are similar sections of a valve which may be at B**, Fig. 1. Fig. 6 is the throttle-valve, as at a^7 . Fig. 7 is a valve which I sometimes use at A** in lieu of the one shown in Fig. 2. Fig. 8 is a water-inlet valve, as at a^9 , Fig. 1.

Similar letters in the drawings indicate corresponding parts.

L is a gas-reservoir, in which gas is stored under great pressure. A tube passes through this reservoir to connect the water-tight compartments at each end thereof, and to permit the passage of wires, &c., for the transmission of electric currents. It will be understood that sea-water has free passage through this tube when once admitted to the compartment A⁷.

The gas-pipe a leads from the reservoir L toward the engine. When the stop-cock a^* is opened, as it will be before starting the boat, the gas passes through a to A**, where its pressure is reduced. It then passes through a^1 to B**, where the pressure is still further reduced. The gas then passes still farther toward the engine through pipe a^2 , past a safety valve at a^6 , to the throttle-valve a^7 , and on to the engine F in due course.

When the throttle-valve is open to permit gas to enter the engine, it also has access to the pipe a^{10} , and by its pressure on the spring a^{11} opens the valve a^9 , which permits the sea-water to enter the vessel through pipe 12, to restore the equilibrium which would otherwise be lost by the escape of spent gas from the engine.

It may be remarked that the gas from the engine is allowed to escape through a suitable exhaust-pipe, or is absorbed for reuse, according to the nature of the gas, and in manner described in my other specifications hereinbefore referred to, or in other suitable manner.

I will now proceed to describe the construction of valves I have found it necessary to use in order to produce the best results with my reservoir, engine, and connections.

The valve a^{**} , which I call a "reducing-valve," and which I prefer to locate as shown in the diagram, Fig. 1, is made as follows: a represents the pipe leading from the reservoir or generator to the engine. A cylinder or box, b^1 , contains an internal cylinder, b^2 , and spaces or passages b^3 exist between these cylinders. The outer cylinder or box, b^1 , is connected at its ends with the pipe a a^1 by suitable couplings, as by the screws b^5 b^6 . a^1 is a valve which is fitted to a seat in the ends or coupling b^6 , whose stem or spindle c extends into the inner cylinder, b^2 , through a packing-box. The end of the stem inside this inner cylinder has a piston, f^1 , fitted to work tight but freely therein.

It will be seen that the area of this piston is greater than that of the valve d^1 . The end of the said cylinder b^2 is open into pipe a^{10} , as shown, so that the pressure inside the outer cylinder and pipe a^1 will act to force the piston f^1 inward and to keep the valve d^1 up to its seat; but when the pressure in the pipe a , acting on the said valve, overcomes the pressure on the piston f^1 , the said valve is forced open and the gas fills the cylinder b^1 and pipe a^1 . When a certain amount

of gas has passed through the valves, determined by the relative size of the valve d^1 and the piston f^1 , the greater area of the piston then gives to the pressure exerted thereon a preponderance over that acting on the valve, so that the latter is immediately closed until the pressure on the valve again preponderates.

It will thus be seen that the action of this valve is automatic; that the pressure on the side farthest from the reservoir will be as much less (on the average) as the size of the piston f^1 exceeds that of the valve d^1 .

The valve B**, Fig. 4, is similar in construction to that just described, and has, in addition, a spring, i , which surrounds the piston-rod e' . This spring can be set to a regulated tension by a screw and nut.

An escape-passageway through the side of the cylinder or box b^1 may be made, to permit the escape of air from behind the piston f^1 , though this is not always necessary.

In practice I prefer to employ both valves A** and B**. The former reduces the gas from the very high pressure it is under in the reservoir, the latter still further reducing it before it reaches the throttle-valve. This gradual reduction of pressure tends to prevent an excess of cold at any one point.

Instead of the valve A** or B**, I may use the valve shown in Fig. 7 as a reducing-valve.

In this case I interpose in the pipe leading from the reservoir a box or chest, b , which has an aperture at c , controlled by a small slide-valve, d , so that when this slide is in the position shown in the drawings there will be a free passage for the fluid through the said pipe; but when the valve d slides over and closes the aperture c , such passage for the fluid will be stopped. This slide-valve d is attached to a rod, e , which extends through the stuffing-box, to a piston, f , fitted in a small cylinder, g . Below the said piston the cylinder g has a pipe, h , which extends to the feed-pipe a^1 , and communicates with the same at some point between the aperture c and the engine.

The valve-rod e is also provided with a spring, i^1 , which tends always to draw the valve down and open the aperture c . This spring is regulated to the desired pressure in the engine-cylinders by means of the screw-nut i^2 , and when the pressure in these cylinders and the portion of pipe adjacent thereto does not exceed the desired limit, the said valve will not completely close the aperture c ; but when the pressure exceeds this limit the piston f will be forced upward, and will overcome the resistance of the spring i^2 , so that the slide-valve d will close the aperture c .

It will be seen that the operation of the reducing-valves depends in a measure upon the rapidity with which the gas in the pipes on the side toward the engine is exhausted.

I will now proceed to describe the construction of the throttle-valve, premising with the statement that I do not claim the electric connections in this application, the same being shown and claimed in another pending application. This valve is shown in section in Fig. 6. a^3 is the pipe which feeds the engine with the gas or other fluid. l is a

valve-box connected with the said pipe, and containing a valve, m , which controls the passage of the fluid through the same, m' is a valve-rod passing through the stuffing-box, and connected with a piston, n , in a cylinder, o . The said rod is provided with a spring, which tends always to keep the valve in a position to close the passage from said pipe a^3 . Below the cylinder o is a box or casing, p , containing a slide, p^1 , and there is a passage, q , forming a communication between the said casing and the space in the cylinder below the piston n . The rod or spring of the slide p^1 is connected with the bell-crank lever p^2 , which is connected with magnets and operated by an electric current passed through the same. q' is an orifice that admits gas to the casing p .

When the current passes in one direction it will move this slide to admit gas through the orifice q' and passage q to the under side of the piston, thereby raising the same and the valve m , which then admits gas to the propelling-engine.

By reversing the electric current the port or passage q is closed and the exhaust-port q^* is opened, the supply of gas being cut off and engine stopped.

As it is intended to retain the vessel as nearly as possible of the same specific gravity as the water in which it is operated, it becomes necessary to restore the equilibrium by introducing some substance into the vessel in lieu of the compressed gas used in propelling the engine. For this purpose I attach the pipe a^{10} between the throttle-valve and the engine. As soon as the throttle-valve is opened the gas-pressure, through intermediate mechanism in a^{10} , opens the valve a^9 , and admits water from outside the boat to the compartment A' through pipe 12, as before stated. The air in compartment A' is permitted to escape through pipe a^{12} into the exhaust.

The engine-compartment is open to the sea, so that it will always be full of water.

The slide-valve d^2 , Fig. 8, closes the pipe 12 at j , so that no water can flow through the same, except when the slide d^2 is raised by pressure on the piston f^2 , which pressure comes from the gas in pipe a^{10} , so that water is admitted to the boat whenever the throttle-valve is open. The opening of the valve which admits it is regulated by the pressure of gas between the throttle-valve and engine.

In this application I have not shown the wires by means of which electric connection between the shore and the various operative mechanisms are maintained, as that is clearly shown in another application now pending.

What I claim is—

1. The combination, with a reservoir and engine of a carbonic acid or ammoniacal gas motor, of a series of pressure-reducing valves, so that the expansion of gas in the supply-pipes is effected gradually to prevent freezing, substantially as described.

2. The reducing-valve described, consisting, essentially, of an external and an internal cylinder, having passages between them, and a piston working within the internal cylinder, which piston closes the controlling-valve by back-pressure, substantially as shown.

3. The combination, in a reducing-valve, of an external and an internal cylinder, having passages between the two, a piston working in the inside cylinder to close the controlling valve, and a spring governing the piston, so that the valve shall only be closed by a pressure sufficient to overcome the spring, as set forth.

4. The combination, in a reducing-valve, of cylinders b^1 and b^2 , having passages between them, the piston f^1 , having its rod passing through a stuffing-box, the spring i , and the valve d^1 , all as shown and described.

5. The combination of a gas-reservoir, an automatic reducing-valve, as A^{**} , a second automatic valve controlled by a spring to reduce the gas to a determinate pressure, as B^{**} , and a throttle-valve, as shown and described.

6. In combination with the engine of a torpedo-boat, the series of pipes and suitable valves, substantially as shown, for supplying gas or other fluid from the reservoir, holder, or generator to the engine, and for exhausting the gas and admitting water to the boat, all arranged and operated as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN L. LAY.

Witnesses:

GEORGE E. HAIGHT.

H. D. WINSOR.

851

DEFENDANT'S EXHIBIT 142.

No. 741,683.

Patented October 20, 1903.

United States Patent Office.

Frank M. Leavitt, of Brooklyn, New York, Assignor to E. W. Bliss Company of Brooklyn, New York, a Corporation of West Virginia.

Gyroscopic Apparatus for Steering Torpedoes.

Specification Forming Part of Letters Patent No. 741,683 Dated October 20, 1903.

Application Filed February 9, 1899. Renewed February 27, 1900.
Serial No. 145,445. (No model.)

To all whom it may concern :

Be it known that I, Frank M. Leavitt, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Gyroscopic Apparatus for Steering Torpedoes and other Uses, of which the following is a specification.

This invention provides an improved gyroscopic apparatus chiefly applicable for the steering of automobile-torpedoes or other submarine vessels, but also in part applicable for other uses wherever a gyroscopic apparatus is desirable. Hence in its broader features my invention relates to gyroscopic apparatus in general, and more specifically it relates to such apparatus in combination with steering mechanism and to the construction of such apparatus in such manner as to facilitate its application to an automobile-torpedo.

A gyroscope consists of a rotatively-mounted body, as a fly-wheel, so supported, usually through the medium of gimbal-rings, that movement or deflection of the structure whereon it is supported will not be communicated to the axial pivots of the fly-wheel in such manner as to force the latter while revolving out of its normal plane of rotation. Hence a fly-wheel or revolving body so mounted is able to preserve its original plane of rotation notwithstanding the movements of the structure upon which it is carried. This capacity for preserving a fixed plane of rotation renders the gyroscope highly useful for many purposes, notably so for controlling the steering of an automobile-torpedo or other craft which after aiming and launching, is left to itself to direct its own course through the water. A gyroscope is also useful for other purposes, one example of which is to preserve a uniform plane on a ship which is pitching or rolling, or both, in order that such plane may be utilized for certain purposes.

No. 741,683.

PATENTED OCT. 20, 1903.

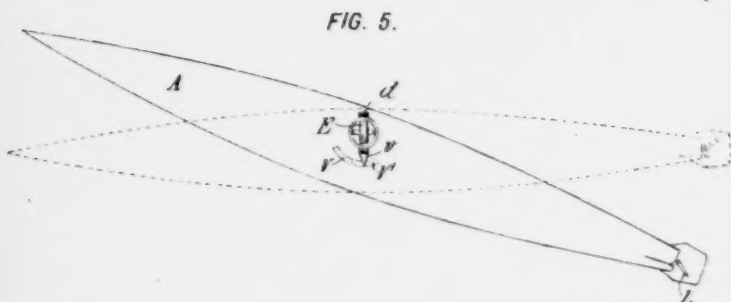
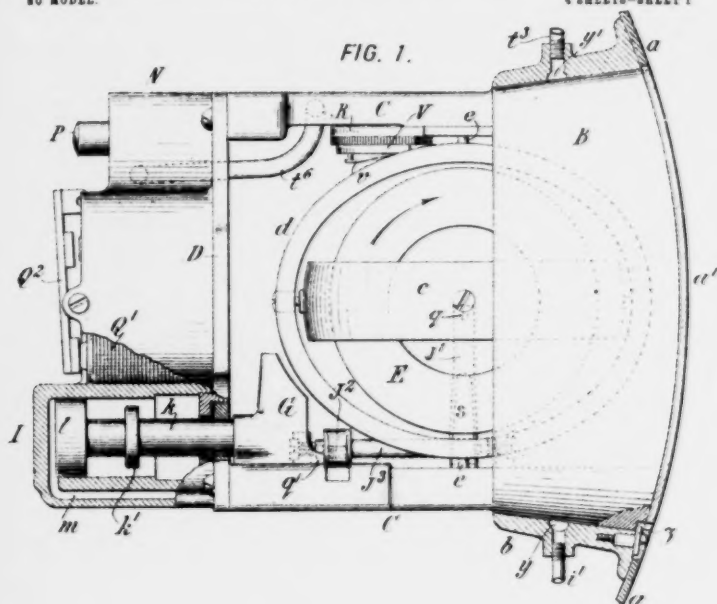
F. M. LEAVITT.

GYROSCOPIC APPARATUS FOR STEERING TORPEDOES.

APPLICATION FILED FEB. 9, 1899. RENEWED FEB. 27, 1903.

NO MODEL.

4 SHEETS—SHEET 1



WITNESSES:

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No. 741,683.

PATENTED OCT. 20, 1903.

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GYROSCOPIC APPARATUS FOR STEERING TORPEDOES.

APPLICATION FILED FEB. 9, 1899. RENEWED FEB. 27, 1903.

NO MODEL.

4 SHEETS—SHEET 2.

FIG. 2.

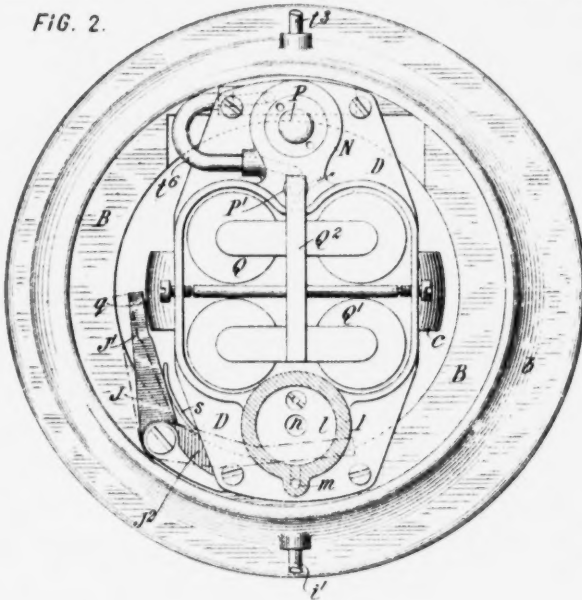


FIG. 6.

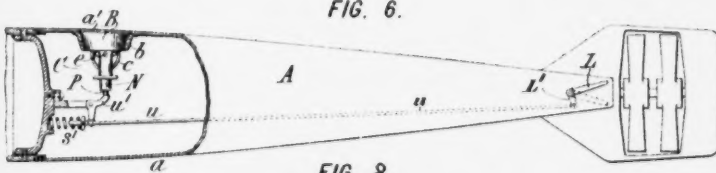
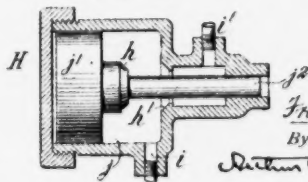


FIG. 8.



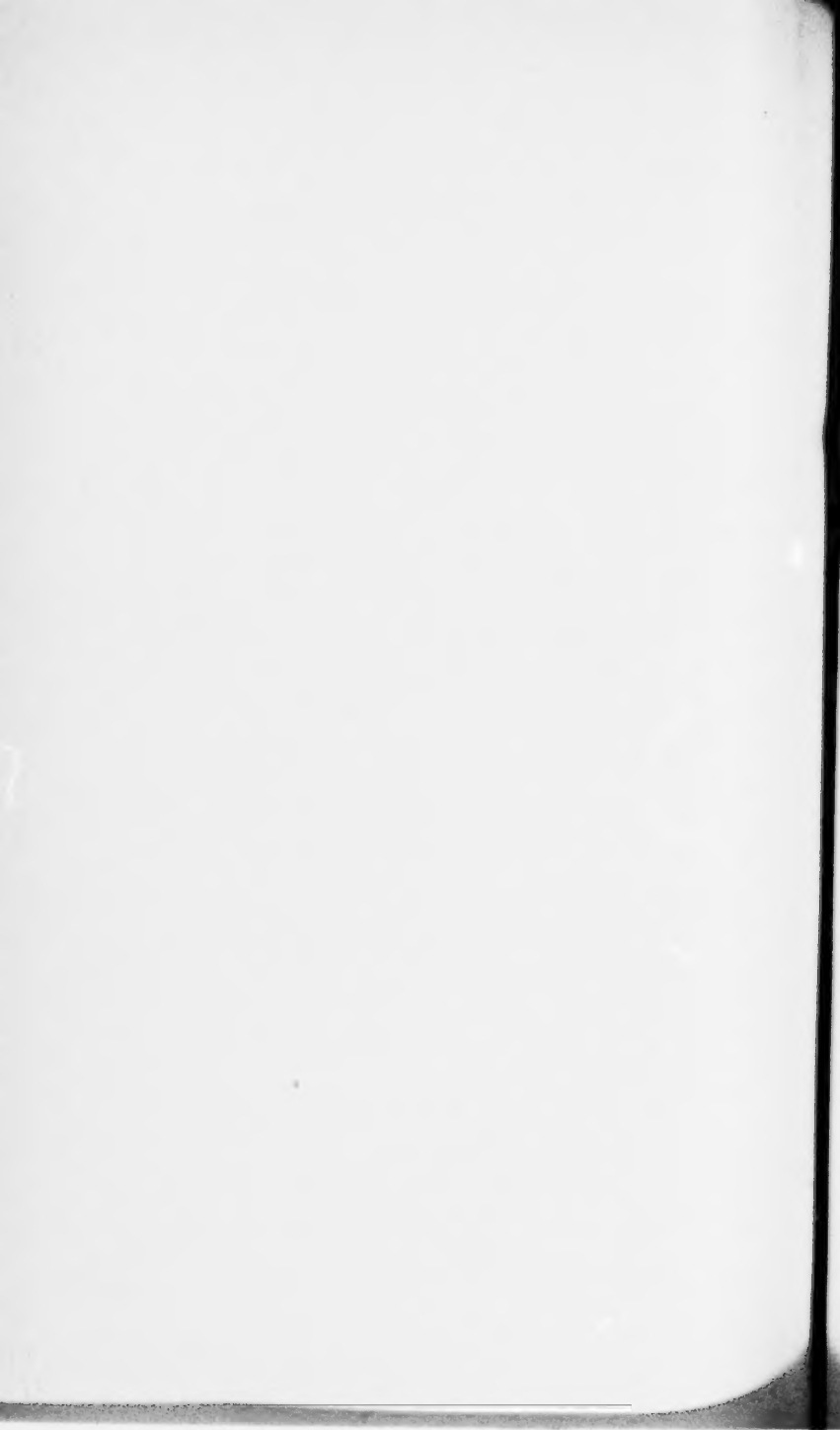
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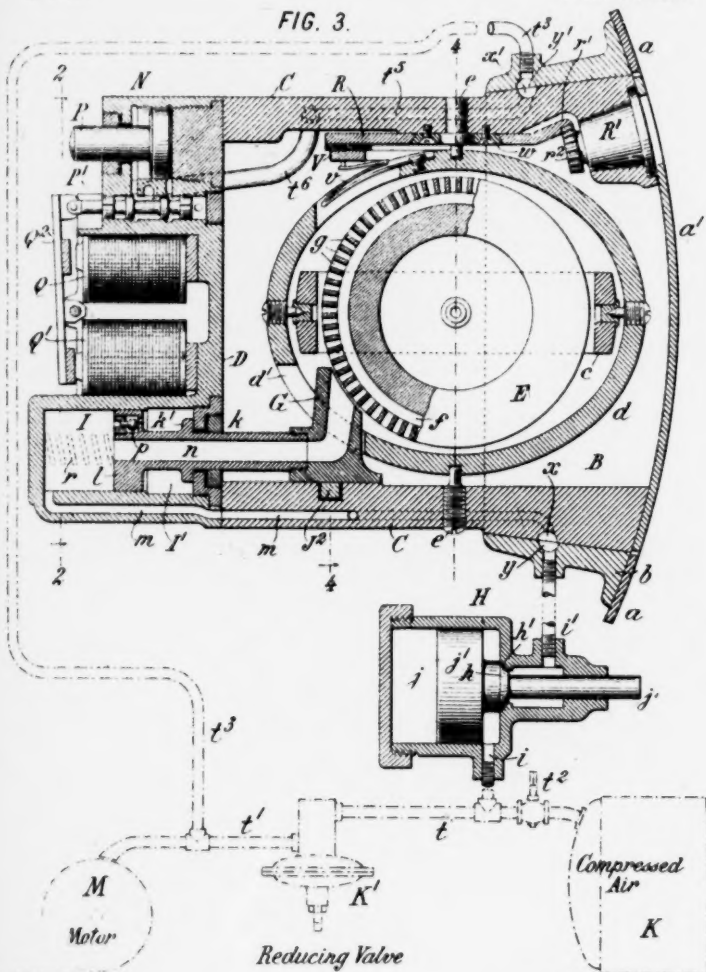
GYROSCOPIC APPARATUS FOR STEERING TORPEDOES.

APPLICATION FILED FEB. 9, 1899. RENEWED FEB. 27, 1903.

NO MODEL

4 SHEETS—SHEET 3.

FIG. 3.



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No. 741,683.

PATENTED OCT. 20, 1903.

F. M. LEAVITT.

GYROSCOPIC APPARATUS FOR STEERING TORPEDOES.
APPLICATION FILED FEB. 9, 1920.

APPLICATION FILED FEB. 9, 1899. RENEWED FEB. 27, 1903.

NO MODEL.

4 SHEETS-SHEET 4

FIG. 4.

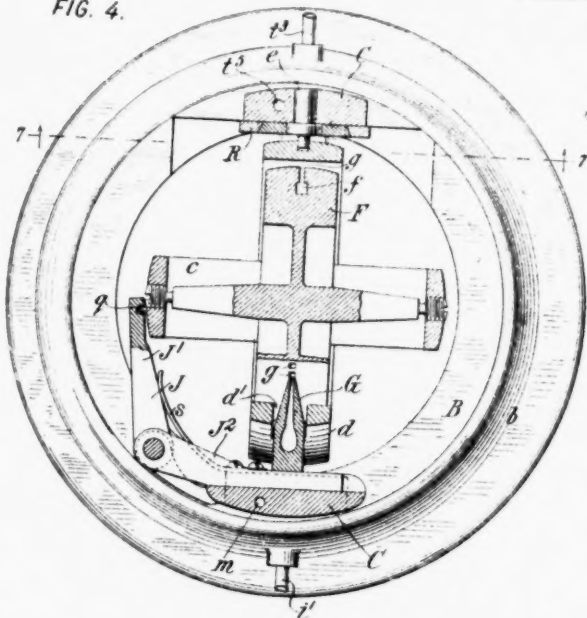
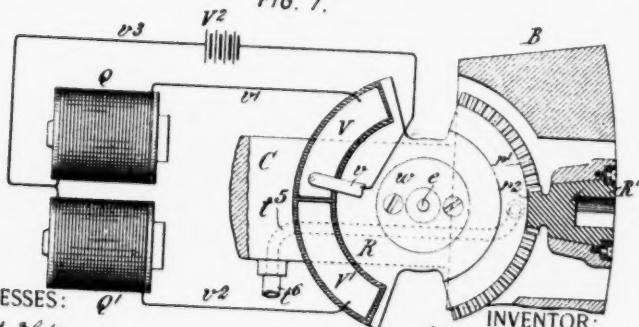


FIG. 7.



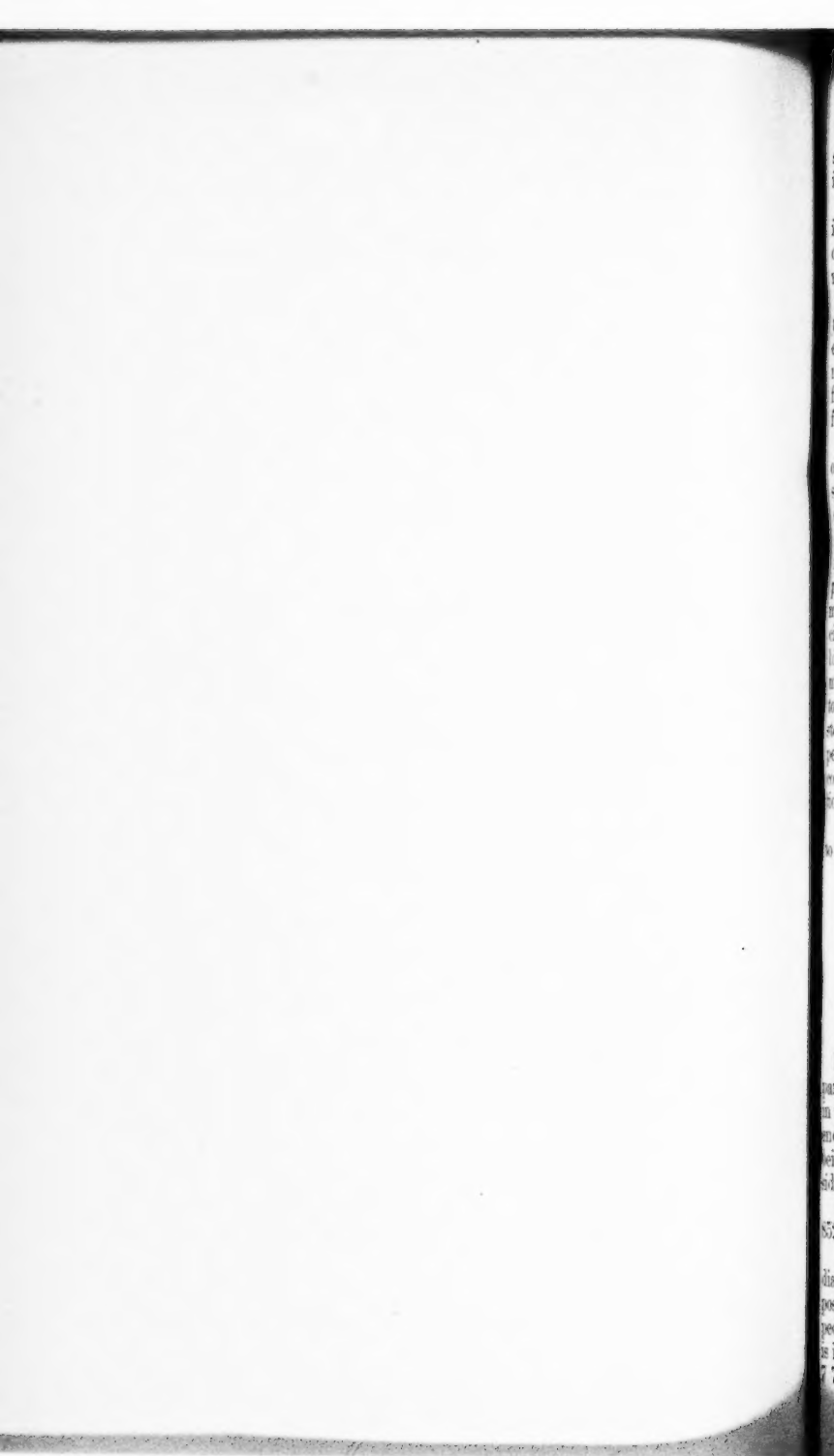
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INVENTOR:

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Frank M. Leavitt,
By his Attorneys.

Arthur C. Orason & Co



such as for determining the instant of firing of guns in order to insure their correct elevation.

Heretofore gyroscopes have been spun or set in rotation by releasing a spring-actuated gearing, or they have been driven in a more continuous manner when necessary by the application of an electro-motor.

According to my invention I provide for spinning the gyroscope by the application of fluid-pressure, preferably compressed air. To this end I combine with the fly-wheel of the gyroscope a fluid-pressure motor, preferably a reaction-motor and preferably one wherein the fly-wheel is formed with reaction-surfaces, and a nozzle is provided for directing the jet of fluid under pressure against such surfaces.

My invention provides novel means for discontinuing the action of said motor after the fly-wheel has been brought up to proper speed, also means for locking fast the gimbal-rings or other mounting of the fly-wheel preliminary to spinning it and for unlocking the same upon completing the spinning in order to leave the gyroscope free, such unlocking means being preferably operated by the fluid-pressure which drives the fly-wheel, and I provide also means for admitting fluid-pressure to said motor during a predetermined time sufficient to spin the gyroscope. As applied to the steering of an automobile-torpedo my invention also provides means for communicating the movements of the gyroscope relatively to the plane of direction of the torpedo from the gyroscope or the universal mounting thereof to the steering-rudder and also for enabling the direction in which the torpedo shall be steered to be adjusted at will, and also provides a special construction of gyroscopic apparatus for facilitating its ready application to or removal from the torpedo.

I will proceed to describe my invention with special reference to its application to the steering of a torpedo.

(Here follow diagrams marked pp. 844, 846, 848 and 850.)

Figure 1 is an elevation of my improved gyroscopic apparatus, partly broken away in section, and showing in section its mounting in the hull or shell of the torpedo. Fig. 2 is an elevation of the inner end of the apparatus, showing also its mounting-ring, the view being partly in section on the line 2 2 in Fig. 3. Fig. 3 is a sectional side view looking in the same direction as Fig. 1 and showing also the pneumatic or fluid pressure appurtenances of the apparatus. Fig. 4 is a view looking in the same direction as Fig. 2 in transverse section on the line 4 4 in Fig. 3. Fig. 5 is a diagram showing in plan a torpedo and showing the gyroscope in position therein. Fig. 6 is a sectional plan of the after part of a torpedo, illustrating the application of my invention thereto. Fig. 7 is in part a fragmentary elevation in section on the plane of the line 7 7 in Fig. 4 and is in part an electrical diagram, showing certain

electrical connections. Fig. 8 is a mid-section of the pneumatic time-valve shown in Fig. 3, showing the latter in a different position, it being closed in Fig. 3 and fully open in Fig. 8. Figs. 2, 3, and 4 show the gyroscope set and at rest preparatory to being spun. Fig. 1 shows it in motion directly after being spun. Fig. 8 shows the position of the time-valve intermediate of the positions just described. Figs. 5 and 7 show the apparatus in operation.

Let *A* in Figs. 5 and 6 designate the hull or body of a torpedo, of which *a* in Fig. 6 is the shell or outer wall. In this shell at one side is formed an opening within which is set a frame or ring *b*. A fragment of the shell *a* and the ring *b* are shown in section in Fig. 1 and also in Fig. 3. Within the conical inner surface of the ring *b* is fitted tightly (preferably by a conical ground joint) a ring *B*, which constitutes the base upon which the gyroscope apparatus is carried. From this base-ring two parallel arms *C C* project horizontally, and across their ends is fastened a head or vertical plate *D*, these arms and plate thus constituting, with the ring *B*, a fixed frame work. Within this framework the gyroscope is mounted. Its fly-wheel *E* is mounted to turn within a ring *c*, which in turn is pivoted on an axis at right angles to the axis of rotation within a second ring *d*, and the latter is pivoted upon an axis at right angles to the pivotal axis just referred to within the fixed frame already described—that is to say, by means of pivots *e e* therein. The rings *c d* are thus the usual gimbal-rings by which the fly-wheel axis is given a universal mounting with reference to the fixed frame *B C D*.

It will be understood that the ring *B* is necessary or desirable only in a torpedo or analogous application and may be substituted by any other suitable base or foot when the apparatus is to be used in other locations, it being only necessary to provide some suitable fixed frame for sustaining the several working parts, the construction of which frame or support may be subject to wide variation, according to circumstances.

For spinning the fly-wheel *E*, I combine with it a fluid-pressure motor. The construction of this motor may be variously modified, and it may be adapted for being driven by different fluids under a variety of pressures and may be connected in various ways to the fly-wheel during the spinning thereof and may be variously disconnected therefrom upon the completion of the spinning in order to leave the fly-wheel free. I prefer the employment of compressed air or other gaseous fluid and to construct the motor as a reaction-motor, preferably combining rotary impact-faces with a stationary nozzle for discharging the stream of fluid against such faces. I prefer also to construct the impact-faces directly upon the fly-wheel itself, so that the latter constitutes not only the fly-wheel of the gyroscope, but also the rotary member of the motor. To this end I form the fly-wheel with any suitable formation of impact-surfaces, the construction clearly shown in section in Figs. 3 and 4 being suitable, and I provide a nozzle *G* from which to direct a thin stream of fluid against these impact-surfaces, a suitable construction of nozzle being that clearly shown in section in Figs. 3 and 4. The impact-surfaces are in the construction shown formed by constructing the fly-wheel *E* with a concentric fluid-passage *f*, from which radiate openings *g g*, extending

to the exterior, these openings being arranged in a plane perpendicular to the axis of rotation, which plane coincides with that of the slit or contracted orifice of the nozzle, so that the nozzle directs a stream of fluid against the walls of the openings, which walls constitute the impact-surfaces. The stream of fluid thus directed against these surfaces on rebounding therefrom flows through the openings into the inner channel *f*, through which it circulates, and thereby distributes itself among the numerous openings through which it finds free escape.

By turning compressed air through the nozzle *G* for a brief interval—say one second or less—the fly-wheel can by this means be spun up to the requisite velocity for storing sufficient power to keep the gyroscope running for a considerable time. In practice in applying my invention to an automobile-torpedo I turn on an air-pressure of approximately thirteen hundred pounds per square inch for one-half second, whereby the fly-wheel is spun up to a speed of approximately eight thousand or nine thousand revolutions per minute, or sufficient to keep it spinning for over ten minutes.

It is necessary to provide means for controlling the flow of compressed fluid to the motor in order to cut off the flow of fluid after a predetermined time—that is to say, after such time as is sufficient to spin up the fly-wheel to the requisite speed. This time will of course vary according to the proportions adopted in any case and also according to the fluid-pressure used and the length of time during which the gyroscope is to remain active. To this end I provide for controlling the supply of compressed air or other fluid a device which I will call a "time-valve." This time-valve, which as a whole is lettered *H*, is shown in section in Figs. 3 and 8. It consists of a stop-valve *h*, adapted to close against a seat *h'*, and thereby cut off

853 communication between the compressed-air inlet *i* and the outlet *i'*, which are on opposite sides of said seat, and of means for operating said valve, comprising a cylinder or chamber *j* and a piston *j'*, working therein and connected to the valve *h*. The normal or starting position of the valve is closed, as shown in Fig. 3. Upon turning on fluid-pressure the latter entering through *i* acts against the piston *j'* to force the latter to the left, to the position shown in Fig. 8, thereby opening the valve *h* and permitting the air to flow through the seat *h'* and out by the outlet *i'* to the nozzle *G*. The body of air originally imprisoned in the chamber *j* to the left of the piston serves as a cushion to check its opening movement. The piston *j'* is not a tight fit with its cylinder, and consequently the compressed air can leak past it and act against its left side or face. The piston is of unbalanced area by reason of being provided with a stem *j²*, which passes out through the valve shell, as shown, so that when the valve is open, as in Fig. 8, the piston *J'* receives the full fluid-pressure against all of its right-hand side except the area of the stem *j²*, which receives only the pressure of the external atmosphere, while the fluid-pressure as fast as it can leak past the piston acts against the full area of the left side thereof, and consequently acts effectively against an area equal to that of the cross-section of the stem, so that the high pressure acting against this differential area forces the piston toward the right with a speed proportionate to the

extent of leakage or looseness of fit of the piston. This movement continues until the valve *h* is again seated, whereupon the flow is shut off, and so long as the fluid-pressure remains turned on the valve continues pressed to its seat thereby. This time-valve thus opens instantly upon the turning on of fluid-pressure and closes progressively at a rate which varies according to the looseness of fit of the piston. By a suitable proportioning of this looseness of fit the valve may be caused to close in any predetermined time desired. This means for controlling the duration of flow is extremely simple and operates with great precision.

It is obviously necessary that the flexible mounting of the fly-wheel should be held rigid during the operation of spinning the fly-wheel up to speed. To this end some suitable means must be provided for locking fast the gimbal-rings *c d*. Such locking device must be unlocked after spinning up the fly-wheel in order to leave the gyroscope free. In order to comply with these conditions, I have devised a locking and unlocking means, which I will now describe. In the ring *d* I form a slot *d'*, Figs. 3 and 4, through which the nozzle *G* projects in order that its tip may come close against the reaction-surfaces of the fly-wheel. Hence the nozzle when in this position, as shown in Figs. 3 and 4, by standing in this slot prevents turning of the ring *d*. The nozzle and slot may be made a close fit, so that the nozzle serves as the lock for the ring, though I prefer to make them a loose fit; but in either case in order to free the ring the nozzle is caused to move backward out of the notch *d'* to the position shown in Fig. 1. This movement I effect automatically by means of the fluid-pressure to such effect that instantly upon the cutting off of the stream of compressed air by the time-valve *H* the nozzle *G* is caused to execute its retreating movement. To this end the nozzle *G* is mounted upon a tubular piston-rod *k*, which carries a piston or plunger *l*, which moves in a cylinder *I*. The compressed air enters the outer end of this cylinder through a duct *m* and flows therefrom through the bore or duct *n* within the piston-rod to the nozzle *G*. The piston *l* in the position shown in Fig. 3 divides the cylinder *I*, thus forming a chamber *I'* beyond the piston, into which the compressed air flows through a small hole in the piston, which is controlled by a check-valve *p*. Hence the instant after the compressed air is turned on the chamber *I'* becomes filled with compressed air at a high pressure and remains so until the time-valve *H* cuts off the flow of air, whereupon the air remaining in the ducts and in cylinder *I* quickly escapes through the nozzle *G*, leaving a charge of air at high pressure stored in the chamber *I'*. This air cannot return into the cylinder *I* past the check-valve *p*, which closes in this direction. Hence the expansion of the confined air in *I'* forces the piston to the left and moves with it bodily the rod *k* and nozzle *G* to the position shown in Fig. 1. A cupped packing around the rod forms a stuffing box for preventing escape of air outwardly. In the normal position an annular collar or flange *k'* abuts against the inner end or head of the cylinder, as shown, and forms a stop. The retreating movement of the nozzle *G* thus accomplishes two results: First, it frees the ring *d*, and, second, it removes the nozzle itself beyond the fly-wheel *E*, and thereby disconnects the fluid-pressure

motor as soon as it has completed its work of spinning up the fly-wheel.

For locking the rings *c* and *d* to hold them immovable while spinning up the fly-wheel I provide a locking-lever *J*, one arm, *J'*, of which has a recess which receives a pin *q* on the ring *c*, preferably near or in the axis of rotation of the fly-wheel, while the other arm, *J²* extends beneath the nozzle *G*, as best shown in Figs. 3 and 4. A spring *s* is suitably arranged to press against the lever *J*, tending to displace it and release the pin *q*; but this is prevented by the arm *J²* being held back beneath the nozzle *G*. When, however, the nozzle *G* is displaced to the position shown in Fig. 1, the arm *J²* is thereby released and swings out under the impulse of the spring, the lever *J* moving to the position shown in dotted lines in Fig. 2 and releasing the pin *q*, so that the ring *c* becomes unlocked simultaneously

with the freeing of the ring *d*. The movement of the arm *J²* 554 just described carries it beyond the ends of the nozzle *G*, as shown in Fig. 1, and hence insures against any possible rebound or return movement of the nozzle *G*, since any such movement would bring a prolongation or toe *q'* thereon against the arm *J²* before the nozzle could move into the path of the ring *d*. The arms *J'* *J²* are both fixed upon an oscillatory spindle *J³*, suitably pivoted upon arms or brackets projecting from the frame *C*. Other specific means for locking the rings may be substituted to be worked, preferably, by the fluid-pressure to such effect that upon the cessation of the jet or blast from the nozzle the rings shall be instantly unlocked.

Before the gyroscopic apparatus is operated—that to say, before compressed air is turned on—it is necessary to set the apparatus. When used in a torpedo, the base-ring *B* and the parts carried thereby are removed from the frame *b*, whereby access is had to all the parts. The rings *c* and *d* are first brought into position, whereupon the spring-pressed lever *J* is moved to engage it with the pin *q*. This brings the arm *J²* down out of the path of the nozzle *G*, whereupon this nozzle is pushed into the slot *d'* in the outer ring until it reaches its proper position close against the fly-wheel, as shown in Fig. 3, with the flange *k'* against the head of the cylinder *I*, as there shown. The apparatus may then be replaced in position in the ring *b*. It may be advantageous to introduce a spring for pressing the nozzle and piston to the right in order to hold the parts firmly in this position before operation, such spring being indicated in dotted lines at *r* in Fig. 3.

I have indicated in Fig. 3 in somewhat diagrammatic manner in dotted lines the pneumatic apparatus employed in an automobile torpedo in order to illustrate the connection therewith of my gyroscopic apparatus. *K* is the usual flask or pressure-cylinder containing compressed air at high pressure, from which leads a pipe *t*, which extends to a pressure-reducing valve *K'* and from which extends a pipe *t'*, which leads to the motor or engine *M* for driving the screws for propelling the torpedo, which motor *M* may of course be the usual reciprocating multicylinder-engine or may be any other suitable motor, that indicated in the diagram being a compressed-air turbine. In the pipe *t* is a valve *t²*, which is the starting-valve,

being opened automatically during the operation of launching the torpedo in the manner well understood. Between this valve and the reducer K' a branch pipe conducts the air under full pressure to the inlet i of the valve H . From the reduced-pressure pipe ℓ' a branch pipe ℓ^s leads for conveying air under lower pressure to the steering apparatus, which will be described. The air for spinning the gyroscope is taken from the high-pressure pipe ℓ in order that the air at maximum pressure may be utilized for spinning up the gyroscope instantly in order that the gyroscope may be rendered active before the torpedo leaves the launching-tube, and consequently while its direction, and hence that of the rotative axis of the fly-wheel, is definitely fixed by the aiming of the launching-tube.

I will now proceed to describe how I apply my gyroscopic apparatus for controlling the steering of a torpedo or other analogous craft.

Referring to Fig. 6, which shows the torpedo in plan, L is the steering-rudder thereof, which is moved between the positions shown in full lines and in dotted lines by means of an internal arm L' , fixed on the rudder-shaft within the hull and connected by a rod u to the gyroscopically-controlled steering mechanism. In the particular construction shown in Fig. 6 this rod u receives at one end the pressure of a spring s' strong enough to throw the rudder to the position shown in full lines, and for throwing the rudder to the dotted-line position a pneumatic engine N , comprising a cylinder and piston, is provided, the piston acting through an elbow-lever u' against the rod u to compress the spring. Other arrangements may of course be substituted; but the means thus shown serves the purpose well. Preferably I mount the pneumatic engine N on the cross-head or plate D by constructing the engine-cylinder as an integral part of this cross-head casting. The piston-rod or plunger P projects out through a stuffing-box, as shown, so that when the apparatus is in place it comes against one arm of the elbow-lever u' in the manner shown in Fig. 6. The pneumatic engine is controlled by a balanced valve P' , (clearly shown in Fig. 3,) by which compressed air entering through a pipe ℓ^s is admitted to either side of the piston, while the exhaust from the opposite side of the piston is permitted to escape to the atmosphere. As this is an ordinary type of pneumatic engine, it requires no special description. The valve P' is operated from the gyroscope in any suitable manner. It might of course be directly connected to the outer ring d of the gyroscope, so that the oscillations of this ring corresponding to changes of direction of the torpedo-hull would act directly against the valve to shift it; but although the valve is balanced, and hence operates with the minimum of resistance, yet such direct connection would impose an amount of resistance to the free oscillation of the ring as would to some extent impair the effectiveness or exactness of operation of the apparatus, and hence I prefer to provide for such connection between the gyroscope-ring and the valve as shall oppose the minimum of retardation to the movements of the gyroscope. To this end I provide for operating the valve electromagnetically under control of a circuit-closer which

is operated by the gyroscope-ring and which circuit-closer can be so delicately adjusted as to impose only the most minute resistance upon the movements of the ring. Accordingly I arrange two electromagnets Q and Q' to act in opposition to each other upon 855 armatures carried by a lever Q^2 , which is connected to the valve P' . Preferably I mount the magnets Q Q' fixedly upon the cross-head D in manner shown and fix their armatures upon opposite arms of the lever; but other arrangements may be substituted to equal advantage. The circuit-closer shown consists of a light spring-arm v , carried by the ring d , as shown in Fig. 3, the free end of this spring terminating in a platinum point, which as the ring oscillates is moved over arc-shaped contact-segments V V' , which are best shown in Fig. 7. These segments are insulated and are connected by circuit wires or conductors v' v'' , respectively, as shown in Fig. 7, to the windings of the respective magnets, the opposite terminals of which windings are connected in a circuit v^3 , which includes an electric battery V^2 (or a dynamo) and terminates in a connection with the spring, v , which connection may be made through the frame, pivots, and ring d . The operation of this connection will be apparent on examining Figs. 5 and 7. In Fig. 5 the dotted lines show the position of the torpedo-boat in following its true course, the plane of rotation of the fly-wheel of the gyroscope being in this instance perpendicular to a vertical plane coinciding with the longitudinal axis of the torpedo. Any deflection of the torpedo from its true course—as, for example, a deflection to the position shown in full lines in Fig. 5—does not alter the plane of rotation of the gyroscope, but simply moves with reference thereto the circuit-closing segments V V' . As soon as the tip of the spring v passes thus onto one of the segments an electric current passes through the corresponding branch circuit v' or v'' and energizes the corresponding magnet Q or Q' , Fig. 7, which, acting through the lever Q^2 , Fig. 3, throws over the valve to the opposite position, and consequently admits compressed air from the pipe t^6 to the opposite side of the piston of the pneumatic engine N , thereby causing movement of the plunger P thereof in such direction as to throw the rudder L , Fig. 6, to the contrary position—that is, to such position as will cause the hull of the torpedo to be steered back into its normal course, being the rudder position shown in full lines at L in Fig. 5. It results from this that the torpedo is steered back until it reaches its normal course, at which instant the tip of the spring, v , Fig. 7, passes across the insulating-gap between the two sectors, and as the rudder position remains fixed, so that the torpedo-hull consequently steers beyond its normal course, the spring passes onto the other segment—as shown, for example, in Fig. 7—thereby cutting off the current from the magnet previously energized and directing it into the other magnet, which again throws over the valve P' and again reverses the pneumatic engine, thus throwing the rudder to the opposite position and steering the torpedo in the contrary direction back toward its normal course. It results from this arrangement that the torpedo follows a sinuous path, steering alternately to right and left of its true course and

repeatedly crossing such true course. In practice, however, the rudder is thrown from one side to the other upon a very slight deflection of the torpedo from its true course, so that its sinuous movements constitute but a slight departure from a straight line constituting the true theoretical course of the craft. The gyroscope should of course be proportioned to continue spinning at suitable speed for a period sufficiently longer than the total duration of run of the torpedo.

In case the launching-tube is aimed in the direction in which it is desired that the torpedo shall travel the segments $V V'$ should be so arranged relatively to the initial plane of the gyroscope that the point of the spring e shall at the instant of launching rest upon the insulating-space between the segments. It is, however, sometimes desirable to launch the torpedo in a different direction from its destined course—as, for example, in launching it from a torpedo-boat in rapid motion it may be desirable to launch the torpedo from the bow or stern and cause the torpedo to assume subsequently the desired course, which may, for example, be athwart ships or ninety degrees from the direction in which it is launched. To enable this result to be accomplished, I mount the segments $V V'$ on an angularly-adjustable base or disk and provide means for enabling this disk to be adjusted to any desired angle. The disk referred to is lettered R , being best shown in Figs. 3 and 7. It is pivotally mounted on the arm C concentric with the pivot e by means of an annular pivotal plate w . For turning the disk R from the exterior I form it with a toothed segment r' , engaged by a pinion r^2 , formed on a rotatively-mounted spindle R' , which is fitted tightly and perfectly by a conical ground joint in a socket formed in the ring V , as shown in Figs. 3 and 7. The spindle R' has a square socket, in which a key may be inserted for turning it. The spindle and disk turn with such friction that they will remain securely in any position to which they are turned. The ratio of the pinion and sector being known, it is only necessary to turn the spindle R' through as many degrees as divided by this ratio will equal the number of degrees that it is desired to displace the disk R , being the same number of degrees through which the torpedo is destined to swing after launching and before reaching its destined course.

Inasmuch as my gyroscopic apparatus includes two pneumatic engines—namely, the fluid-pressure motor and its appurtenances for spinning up the fly-wheel and the pneumatic steering-engine N —it is desirable to provide some convenient means for effecting the necessary connections between these parts, which are removable with ring B and the pipes conveying pneumatic pressure within
 856 the shell of the torpedo. Obviously it would be very difficult to provide for making such connections by means of couplings or screw-joints such as are usually employed. Accordingly I provide for making the necessary pneumatic connections through the ground joint uniting the base-ring B to the frame or ring b , in which it fits. To this end I form the base-ring b at suitable positions with a connection for receiving the outlet-pipe i' from the time-valve, terminating in an inner groove or channel y , Fig. 3, and with a connec-

tion for receiving the low-pressure branch pipe t^3 , terminating in an internal groove or channel y' , and I form the ring B with external grooves or channels x and x' , which when the ring is in position coincide with the said channels y and y' , respectively. From the groove or channel x a duct or passage m is formed through the ring B and arm C, leading to the cylinder I. From the channel x a duct or passage t^5 is formed through the material of the ring and upper arm C, following the course indicated in dotted lines at t^5 in Fig. 7 and communicating with the pipe t^6 , by which the compressed air under reduced pressure is led to the inlet-port of the valve E' of the pneumatic engine N. The conical surfaces of the ring B and frame b are ground to a tight fit, and when the ring is in position it is held by any suitable means—as, for example, by two or more fastening-screws, of which one is shown at z in Fig. 1. By removing these screws the ring B may be removed, thereby disconnecting the gyroscope and all its appurtenances from the hull of the torpedo. The outer side of the ring B is closed by a shell a' , which when in place forms a continuation of the main shell a of the torpedo.

In the adaptation of my invention to a torpedo its preferred form, as shown, is advantageous in that the gyroscope and its motor and also the steering-engine and all intermediate and accessory parts are compactly but accessibly mounted upon the one support in such manner that the whole can be conveniently taken out of the torpedo-hull, and hence can be readily inspected or adjusted. Also the removal of these parts leaves the ring or frame b as a large hand-hole through which access can be had to the part through which the steering movements are communicated to the rudder.

My invention in its broader aspect provides a very simple mechanism for effecting automatically the spinning up and unlocking of a gyroscope, utilizing therefor a source of energy many times greater than can be practically attained by either a spring-motor or an electromotor. My invention thus attains a simplification of the accessories of the gyroscope and at the same time adds greatly to the effectiveness of the gyroscopic apparatus.

It must not be inferred from the particularity of detail with which I have described the preferred form of my apparatus that my invention is by any means limited to the details thus set forth, since, in fact, my invention in its broader aspects is susceptible of a wide degree of modification and may be availed of by means of a great variety of mechanical details and accessory or intermediary devices. For example, the fluid-pressure motor may be any other known type of reaction-motor. Also circuit-closer $V V' v$ may be substituted by any other suitable construction of circuit-closer. Also instead of using two magnets $Q Q'$ to act against each other a single magnet may be provided acting against any suitable opposing or retractile force. Also it is within my invention to dispense entirely with electromagnetic means for connecting the gyroscope to the valve of the pneumatic steering-engine, since other means for controlling this engine from the gyroscope may be substituted if sufficiently delicate in operation to avoid interposing any serious resistance to the movements of the gyroscope. It is also apparent that in lieu of a pneu-

matic engine any other means controllable by the delicate action of the gyroscope and capable of transmitting the requisite power to the steering-rudder or other thing to be operated may be substituted. My invention may be otherwise modified in many ways or may be availed of in part only, according to the particular circumstances under which it is applied in any special case and depending upon the particular service it is there destined to perform.

I claim as my invention the following defined novel features, substantially as hereinbefore specified, namely:

1. A gyroscope having a fluid-pressure reaction-motor for spinning it, combined with means for controlling the admission of fluid pressure to said motor during a predetermined time sufficient to spin the gyroscope, said means being adapted to thereupon cut off the flow of fluid thereto.

2. A gyroscope having a fluid-pressure motor for spinning it, combined with a source of pressure, and a valve adapted to admit fluid-pressure to said motor during a predetermined time sufficient to spin the gyroscope, and thereupon to cut the flow of fluid thereto.

3. A gyroscope having a fluid-pressure motor for spinning it, combined with means for admitting fluid-pressure to said motor during a predetermined time sufficient to spin the gyroscope, consisting of a valve and its actuating-piston, the latter presenting its full area for closing the valve and a diminished area for opening it, and means for admitting a restricted flow or leakage to the back of said piston for closing the valve.

4. A gyroscope comprising a fly-wheel mounted in gimbal-rings, having a fluid-pressure motor for spinning it, combined with means for controlling the admission of fluid-pressure to said motor.
857 and means actuated by the fluid-pressure for disconnecting said motor upon the cessation of the flow of fluid to said motor.

5. A gyroscope having in combination reaction-surfaces, a nozzle for directing fluid under pressure against said surfaces for spinning the gyroscope, and means for automatically withdrawing said nozzle after spinning to leave the gyroscope free.

6. A gyroscope comprising a fly-wheel mounted in gimbal-rings, said fly-wheel formed with reaction-surfaces, combined with a nozzle for directing fluid against said surfaces for spinning the wheel, one of said rings formed with a slot through which the nozzle enters, whereby when the nozzle is in place it locks said ring, and means for withdrawing said nozzle from said slot after spinning to unlock said ring.

7. A gyroscope comprising a fly-wheel mounted in gimbal-rings, having a fluid-pressure motor for spinning it, combined with means for controlling the admission of fluid-pressure to said motor, means for locking fast said rings during spinning, and means for unlocking said rings upon the cessation of the flow of fluid to the motor.

8. A gyroscope comprising a fly-wheel mounted in gimbal-rings, having a fluid-pressure motor for spinning it, combined with means for locking fast said rings during spinning, comprising a spring-pressed lever engaging the rings and tending to disengage itself

therefrom, and means for normally holding said locking-lever in the locking position, adapted to be displaced to free said lever upon the cessation of the fluid-pressure feeding said motor.

9. A gyroscope comprising a flywheel mounted in gimbal-rings, combined with a fluid-pressure motor for spinning it, means actuated by the fluid-pressure for withdrawing the nozzle of said motor upon the cessation of the flow of fluid thereto, and a locking device for holding said rings during spinning, tending to unlock and restrained therefrom by engagement with said nozzle, and freed to unlock the rings by the withdrawal of said nozzle.

10. A gyroscope comprising a fly-wheel mounted in gimbal-rings, said fly-wheel formed with reaction-surfaces, combined with a nozzle for directing fluid under pressure against said surfaces for spinning it, and a cylinder and piston, said cylinder communicating with the same source of fluid-pressure as said nozzle, and the piston moveable therein connected to said nozzle, whereby its movement under impulse of the fluid-pressure withdraws said nozzle from the fly-wheel.

11. A gyroscope comprising a fly-wheel mounted in gimbal-rings, said fly-wheel formed with reaction-surfaces, combined with a nozzle for directing fluid under pressure against said surfaces for spinning it, and a cylinder and piston, said cylinder communicating with the same source of fluid-pressure as said nozzle, and the piston movable therein connected to said nozzle for communicating movement thereto, having a duct for permitting compressed air to pass said piston and accumulate a pressure upon the opposite side thereof, whereby upon the cessation of the flow of fluid under pressure to said nozzle, the accumulated pressure beyond said piston acts to displace said piston and thereby withdraw the nozzle.

12. A gyroscope comprising a fly-wheel mounted in gimbal-rings, said fly-wheel formed with reaction-surfaces combined with a nozzle for directing fluid under pressure against said surfaces for spinning it, and a cylinder and piston, said cylinder communicating with the same source of fluid-pressure as said nozzle, and the piston movable therein connected to said nozzle for communicating movement thereto, having a duct for permitting compressed air to pass said piston and accumulate a pressure upon the opposite side thereof, and a valve in said duct for checking the return flow of fluid there-through, whereby upon the cessation of the flow of fluid under pressure to said nozzle the accumulated pressure beyond said piston acts to displace said piston and thereby withdraw the nozzle.

13. A gyroscope comprising a fly-wheel mounted in gimbal-rings, said fly-wheel formed with reaction-surfaces combined with a nozzle G movable toward and from said fly-wheel, a cylinder I, a piston I movable therein, a tubular piston-rod k connecting said piston to said nozzle, a passage admitting fluid-pressure to said cylinder, and a duct permitting fluid-pressure to flow past said piston to accumulate in the opposite end of said cylinder, to the effect set forth.

14. A gyroscope comprising a fly-wheel mounted in gimbal-rings, a spring-pressed locking-lever J for locking fast said rings during spinning, a fluid-pressure motor for spinning the fly-wheel, a cylinder

and piston connected to the same source of fluid-pressure, and a movable part for holding said lever in its locking position, connected to said piston to be withdrawn to release said lever upon the cessation of the flow of fluid under pressure to said motor, whereby the gimbal-rings are unlocked automatically after spinning.

15. A gyroscope comprising a fly-wheel mounted in gimbal-rings, a spring-pressed locking-lever J for locking fast said rings during spinning, the nozzle G of a fluid-pressure motor for spinning said fly-wheel, a cylinder and piston connected to the same source of fluid-pressure to move the piston upon the cessation thereof, and said piston connected to said nozzle for communicating a retreating movement to the latter, and said nozzle arrangement in its operative position to hold said locking-lever in its locking position, and when retracted to free said lever and thereby cause the unlocking of the rings after spinning.

16. A gyroscope combined with a fluid-pressure motor for spinning it, an electric circuit controlled by said gyro-scope, and
858 a circuit-closer comprising a stationary conducting-segment, and a contact-arm carried by the gyroscope and movable over and beyond said segment.

17. A gyroscope combined with an electric circuit controlled thereby, a circuit-closer comprising a normally stationary segment, and a contact-arm carried by the gyroscope and movable over said segment, and an adjustable part carrying said segment movable around the pivotal axis of the gyroscope, whereby the adjustment of said part to different angles determines the point in the oscillation of the gyroscope at which the circuit shall be closed or broken.

18. A gyroscope combined with an electric circuit controlled thereby, a circuit-closer comprising a normally stationary segment, and a contact-arm carried by the gyroscope and movable over said segment, an adjustable plate or disk carrying said segment, formed with a segmental gear and a pinion meshing therewith, whereby to adjust said plate or disk to varying angles.

19. In an automobile torpedo or analogous craft, the combination of a source of compressed fluid thereon, a steering-rudder, a gyroscope, a fluid-pressure motor for spinning the latter, a valve for admitting fluid-pressure from said source to said motor for a predetermined time sufficient to spin the gyroscope, a fluid-pressure engine connected to and operating said rudder, fed with pressure from said source, and connections between the gyroscope and the valve of said engine, whereby the latter is controlled by the gyroscope.

20. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, of a removable ring fitting said frame, a gyroscope carried thereby, a fluid-pressure motor carried thereby for spinning said gyroscope, a reservoir of fluid under pressure carried in said hull, and a valved passage connecting from said reservoir to said motor.

21. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, of a removable ring, fitting said frame, a

gyroscope carried thereby, a fluid-pressure motor carried thereby for spinning said gyroscope, a reservoir of fluid under pressure carried in said hull, and a valved passage leading from said reservoir through the joint between said annular frame and ring to said motor, whereby the connection of the source of fluid-pressure to the motor is made in the act of fitting in said ring.

22. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, of a removable ring fitting said frame, a gyroscope carried thereby, a fluid-pressure motor carried thereby for spinning said gyroscope, a fluid-pressure engine also carried by said ring, and a connection between the gyroscope and the valve of said engine for controlling the latter, a reservoir of fluid-pressure carried in said hull, and a valved passage leading from said reservoir and having branches connected respectively with said motor and said engine, said passage leading through the joint between said annular frame and ring, whereby the fitting of said ring in place effects the connection of said motor and engine to the source of their supply.

23. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, and having a conical inner face, of a removable ring having a conical outer face fitting into said frame with a ground joint, a gyroscope, and a fluid-pressure motor for spinning it, carried by said ring, a reservoir of fluid under pressure in said hull, and a passage leading from said reservoir to and through said annular frame to the joint-face thereof, and said ring formed with a passage leading from its joint-face in coincidence with and forming a continuation of said first-named passage, and leading to said motor.

24. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, of a removable ring fitting said frame, a gyroscope carried thereby, a fluid-pressure motor carried thereby for spinning said gyroscope, a pneumatic engine to be controlled by said gyroscope, also carried by said ring, an electromagnetic device operating the valve of said engine, and a circuit-closer controlling said electromagnetic device and operated by said gyroscope, both carried by said ring, whereby, the removal of the ring removes together the gyroscope, its motor, the engine controlled thereby, and the intervening connection, without disturbance thereof.

25. In an automobile torpedo or analogous craft, the combination with the hull thereof having an opening and an annular frame encircling said opening, of a removable ring fitting said frame, a gyroscope carried thereby, a circuit-closer carried thereby and comprising a normally stationary conducting-segment, and a contact-arm carried by the gyroscope, an adjustable plate or disk carrying said segment, movable to varying angles around the axis on which the gyroscope turns, and a spindle engaging said disk for turning it and passing through said ring to be operated from the exterior, whereby the circuit-closer may be set to varying angles from the exterior of the hull.

26. In an automobile torpedo or analogous craft, the combination

with the hull thereof, its steering-rudder, a gyroscope for controlling said rudder, and electric circuit constituting part of the 859 & 860 connection through which the gyroscope controls the rudder, a circuit-closer controlling said circuit and operated by the gyroscope, and an adjustable plate carrying said circuit-closer and movable to varying angles around the axis upon which the gyroscope turns, whereby the preliminary adjustment of said plate to any angle determines the direction of the course in which the torpedo shall be steered.

27. In an automobile torpedo or analogous craft, the combination with the hull A thereof, its steering-rudder L, its operating-rod *u* within the hull, a spring acting against said rod, and an elbow-lever *u'* connected to said rod, of a gyroscopic apparatus comprising a base-ring B fitting into an opening in said hull, a gyroscope carried thereby, and a fluid-pressure steering-engine N also carried thereby and terminating in a plunger P which when the gyroscopic apparatus is in place acts against one arm of said elbow-lever in opposition to said spring.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

ARTHUR C. FRASER,
FRED WHITE.

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DEFENDANT'S EXHIBIT 143.

English Letters Patent No. 12026 of 1848 to Robert Wilson for "Improvements in certain kinds of Rotatory Engines worked by Steam or Other Elastic Fluids, part of which Improvements are Applicable to Rotatory Engines Worked by Water or by the Wind, Also an Improvement in Safety Valves for Steam Boilers."

Enrolled July 12, 1848.

[Extracts from Specification.]

A. Figure 3, is the foundation frame of the engine; B, B, and D, D, are the two side plates, fastened in parallel vertical planes by bolting their respective suspending flanges *b* and *d* down to the frame A; H is the large outer ring, fastened by numerous screws to the borders of the side plates B, B, and D, D, so as to form a steam-tight case wherein the two revolving wheels are included; one of them with its three circular concentric rows of vanes is marked G, G, *g, g, u, u, w, w*, and F, F, is its axis; and the other wheel with its three concentric circular rows of vanes is marked R, R, *s, s, t, t, v, v*, and Q, Q, is its axis. Figures 3 and 4 show how the several rows of vanes on one wheel are included between those of the other wheel. The two axes, F, F, and Q, Q, pass through the stuffing boxes *e e*, and *e e*, at the centres of the side plates plates B, B, and D, D. The centre bosses of the two wheels G, G, and R, R, are firmly fastened on the extreme ends of their respective axes F, F, and Q, Q, which must be very true and steady in revolving. A centre pivot *x* of steel is fastened into the centre of the said extreme end of one axis F and enters into a corresponding hole at the centre of the extreme end of the other axis Q, in order to retain the two axes more truly in the same straight line.

The axes F and Q are also sustained at their outer ends in bearings at W, W, which are affixed to the frame A; and for greater steadiness of motion, conical centre points at the ends of two fixed steel pins *a, a*, are applied to centre holes at the outer extremities of each axis F and Q, in the same manner as already explained respecting Figure 1. The two wheels being so mounted in the case do not touch any part thereof, neither do they touch each other, neither do any of the vanes of one wheel touch any of the vanes of the other wheel, although the vanes of the different circular rows are as close one to the other as they can be without touching. The manner in which the three rows of vanes of one wheel are included between the three rows of vanes on the other wheel is further represented in Figure 4, where the reversed curvatures of the vanes of the different rows is also seen.

* * * * *

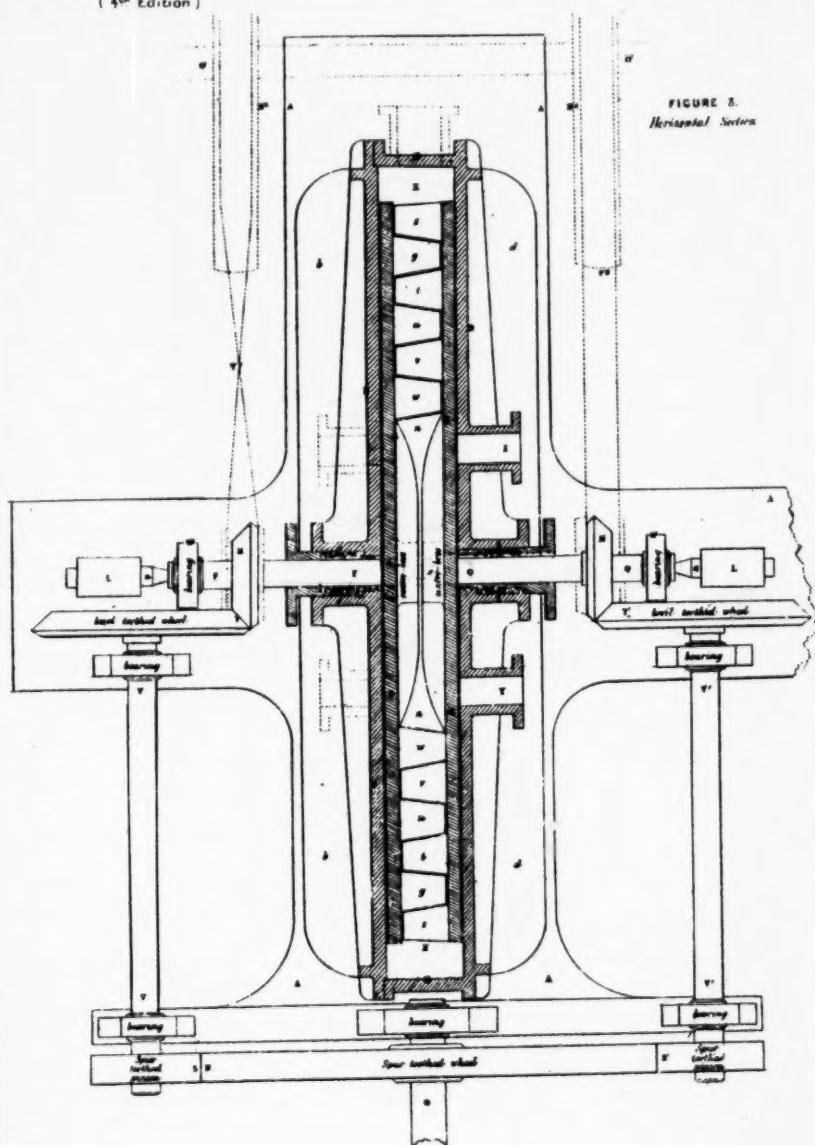
As the two wheels G and R are impelled round in contrary directions one to the other, their axes F and Q must be so connected (by

intervention of suitable wheel-work or pulley-work) to one common axis as to turn that axis around with a slower motion produced by the concurrent action of both the axes F and Q which are turning round in contrary directions. A suitable arrangement of toothed wheel-work for that purpose is shown by way of example in the horizontal plan Figure 3, where M and M¹ are bevil pinions fastened on the axis F of the wheel G and on the axis Q of the wheel Q, respectively, and those bevil pinions turn the two bevil wheels T and T¹ on the ends of the two horizontal axes V, V, and V¹, V¹¹, and on the other ends of those axes are two spur pinions S and S¹ for actuating a large spur wheel N on the horizontal axis O, which is that already mentioned as being a common axis, for it receives its motion and power with a much slower rate of revolution from the concurrent action of both the revolving wheels G and R, although those wheels revolve in contrary directions one to the other. The said axis O is to communicate its motion by suitable means to the machinery that is to be worked by the rotatory engine. Or, in case it is intended that the motion shall be transmitted by pulley-work and endless straps or belts, then two pulleys for such straps may be substituted for the two bevil pins M and M, and two endless straps passing around those pulleys may also pass (as shown by the dotted lines V² and V³, around two large wheels N² and N³ (dotted), both being mounted on the same horizontal axis O¹ (dotted) which would be a common axis of the kind already mentioned; for one of the said straps V² being crossed, and the other strap V³ not being crossed, both those straps would concur in turning the axis O round with a reduced rate of revolving motion, which may be transmitted by any suitable connections with the machinery that is to be worked by the rotatory engine.

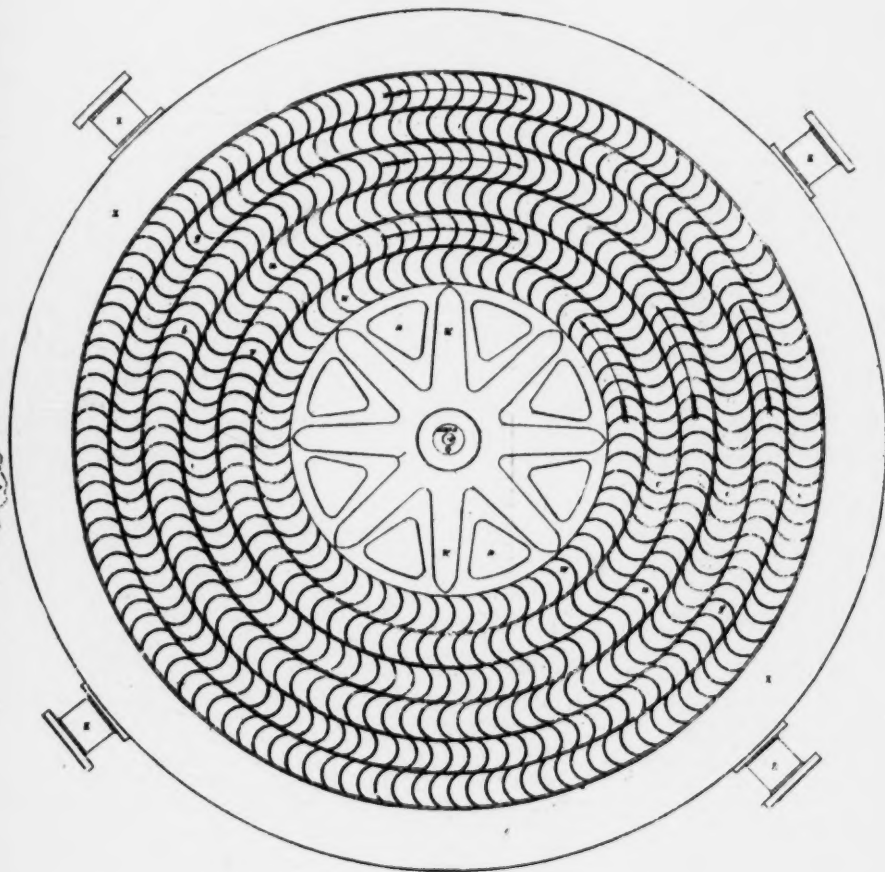
(Here follows diagram marked page 865.)

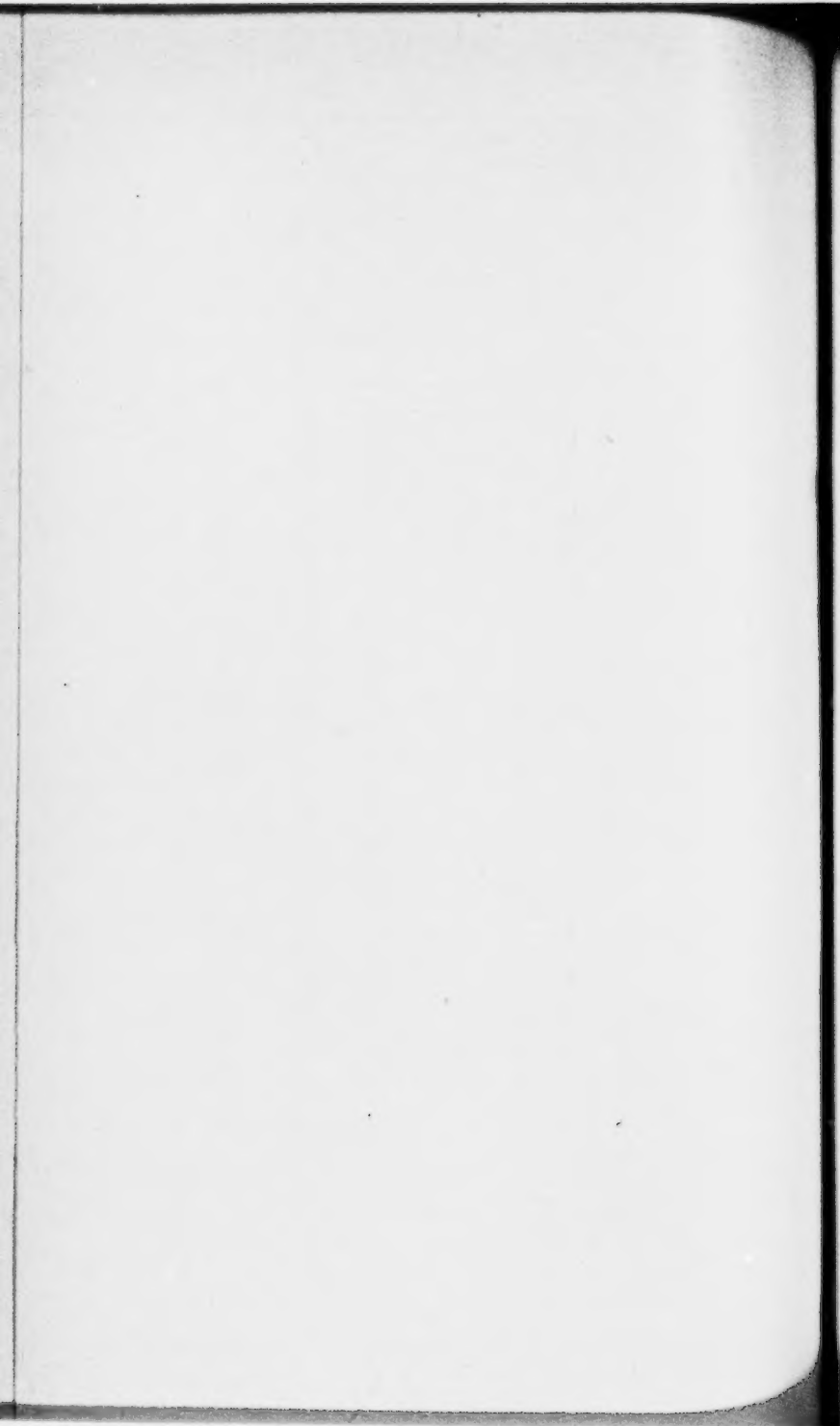
A.D. 1848. JAN. 13. N^o. 12,026.

WILSON'S SPECIFICATION.

(4th Edition)

The enrolled drawing is colored.

FIGURE 4.
Vertical Section.*Scale of Feet.*

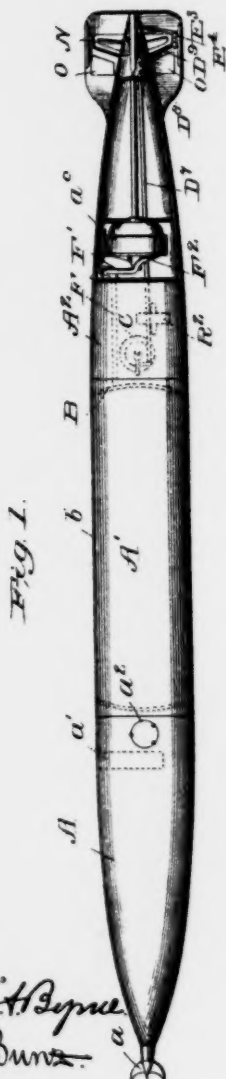


No. 818,987.

PATENTED APR. 24, 1906.

T. H. WHELESS.
 AUTOMOBILE TORPEDO.
 APPLICATION FILED OCT. 12, 1903.

5 SHEETS-SHEET 1.

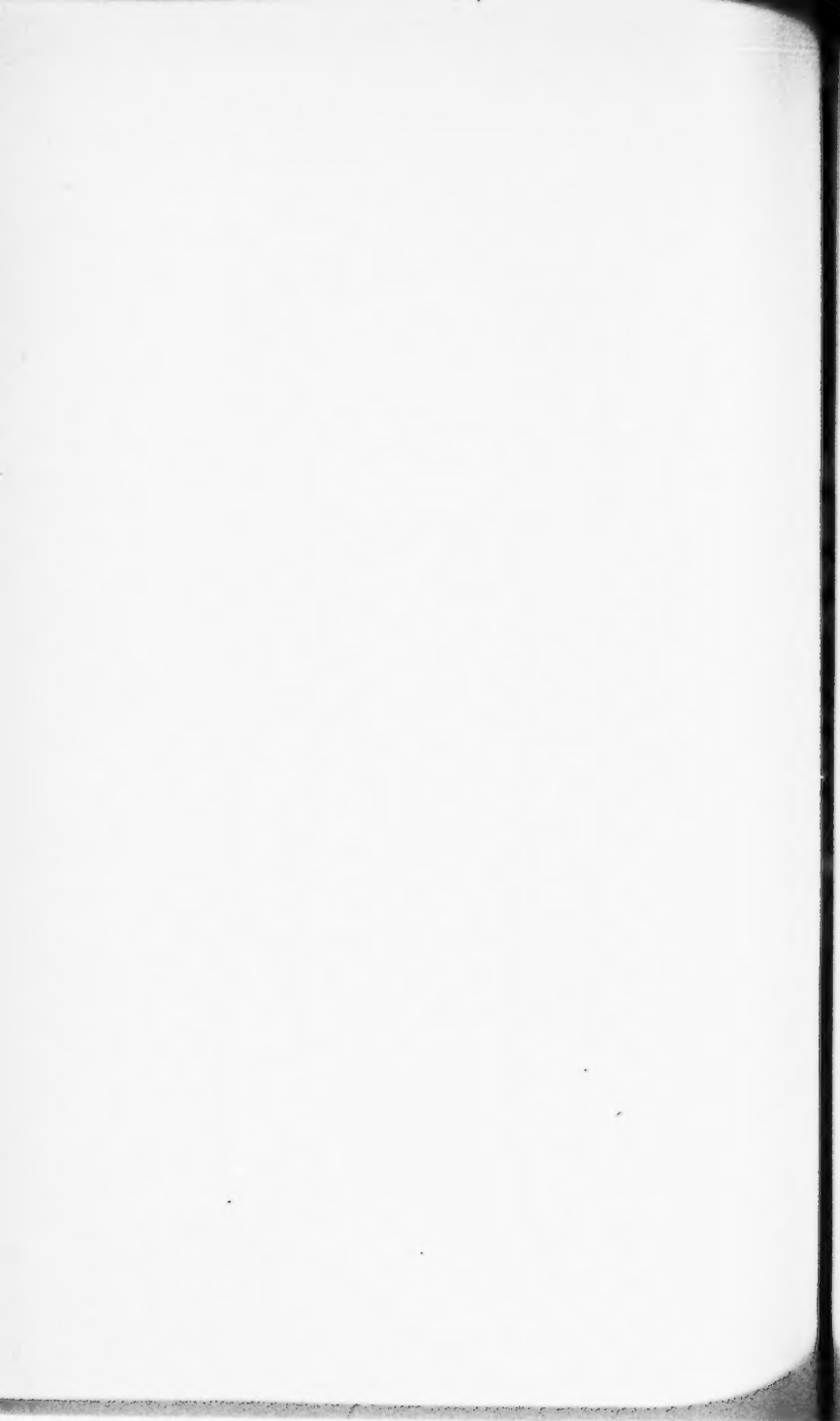


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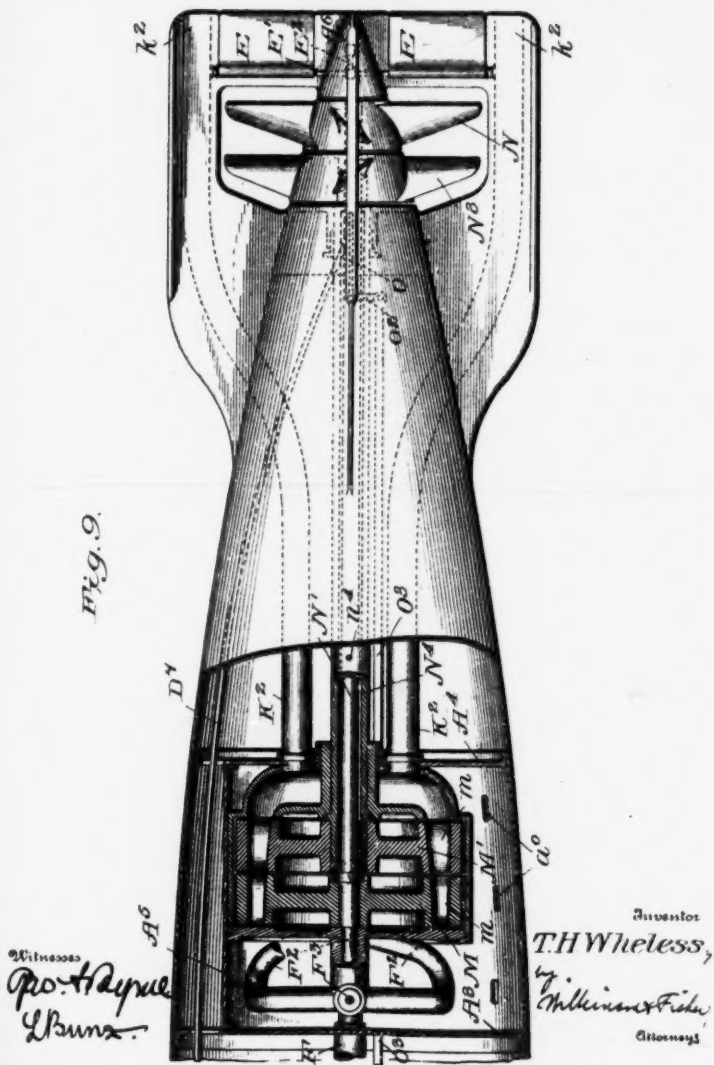


T. H. WHELESS.
AUTOMOBILE TORPEDO.

APPLICATION FILED OCT 12, 1903.

5 SHEETS—SHEET 5.

Fig. 9.





DEFENDANT'S EXHIBIT 144.

United States Patent Office.

Thomas Henry Wheless, of New York, N. Y.

Automobile Torpedo.

No. 818,987.

Patented April 24, 1906.

Specification of Letters Patent.

Application Filed October 12, 1903. Serial No. 176,766.

To all whom it may concern :

Be it known that I, Thomas Henry Wheless, a citizen of the United States, residing at New York city, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Automobile Torpedoes, (Case C;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in automobile torpedoes; and it is intended to provide improved mechanism for steering the torpedo or guiding it in the horizontal plane.

My invention will be understood by reference to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

(Here follow diagrams marked pages 868 & 870.)

Figure 1 is a side elevation of the torpedo, part of the tail being broken away. Fig. 2 is a plan view of the torpedo, part of the tail also being broken away. Fig. 3 is a central vertical section through part of the tail of the torpedo, the same being along the line 3 of Fig. 4 and looking in the direction of the arrows. Fig. 3^a is a detail illustrative of part of the mechanism for spinning up the gyroscope. Fig. 4 is a plan view, partly in section, of the diving, steering, and propelling mechanism contained in the tail of the torpedo, the torpedo-shell being shown in section. Fig. 5 is a detail showing the arrangement of levers for operating the immersion-rudders. Fig. 5^a shows the immersion-rudders in plan. Fig. 6 is a horizontal section through the two cylinders of the steering-engine.

Fig. 7 is a cross-section through the two cylinders of the steering-engine along the line 7 7 of Fig. 6, the valve being shown in elevation. Fig. 8 shows diagrammatically the connection between the piston-rods of the steering-engine and the steering-rudders, and Fig. 9 shows two propellers driven by a compound turbine.

The torpedo is intended to be operated by compressed air or gas and consists of three main parts; the head A, with the explosive and firing device; the middle part A', containing the air-flask, and the after part A², containing the propelling mechanism and the means for controlling the immersion of the torpedo, as also the means for steering the same in the horizontal plane. The head A is detachable, and for exercise practice a special head can be used, which is provided with a calcium-phosphid pocket *a'* and a depth-register pocket *a''*, similar to those used in other types of torpedoes. On the nose of the head A is a nose-tube with screw-fans *a*, which if used on the war-head will cock the firing-pin during the first part of the running, as is well known in the art. Through the middle of the head passes the primer-case, (not shown,) which is surrounded by the explosive, as in the other well-known types of automobile torpedoes.

The compressed-air flask B is made of rolled steel, with two strong end caps, and can be charged by the inlet-valve *b* in the top of the middle part of the torpedo.

The mechanism pertaining to my present invention is included in the tail portion A² of the torpedo and will now be described.

C represents a flanged hollow cylinder which is secured to the shell of the torpedo, which shell is perforated in front of said cylinder, as shown in Fig. 4, to permit the influx of water. In this cylinder is mounted a piston C', fast to the piston-rod C², and this piston travels freely in the ring C^o and has secured to its face a flexible diaphragm *c*, held to the face of the piston by the washer *c'* and clamped in the cylinder C by the ring C^o. Thus this piston is free to move longitudinally in the cylinder, while the diaphragm prevents the passage of water therethrough. The piston-rod C² carries a projecting arm *c''* and is provided with a tail *c''*, passing through a suitable guide *c'*. (See Fig. 4.) Underneath this arm *c''* engages one end of the lever D, which is pivoted, as at *d*, in a suitable bracket C⁴ and has its other end connected to the rod D', to which is secured the coil-spring D², the lower end of which spring is connected to the rod D³, which is squared, as at *d''*, to pass into the bearing *a''* in the bracket A⁴. The end of this rod D³ is screw-threaded internally to receive the screw D⁴, which is provided with a collar *d''* and a squared head *d'*, by means of which said screw may be turned, as by using an ordinary key, and thus the tension of the spring D² may be adjusted so as to have the immersion-piston set for the desired depth. A compensating spring D⁵ is used to steady the immersion mechanism when the torpedo is running near the surface of the water; otherwise the spring D² would have to be so nicely adjusted that the parts would vibrate too much under the shock of discharge or when the torpedo strikes the water. By having a compensating spring the spring D² is always under initial tension. The

lever D is fastened to a shaft d , which shaft carries the arm D^6 , which is pivoted at d^6 to the connecting-rod D^7 , which is pivotally connected to the bell-crank lever D^8 , connected by the rod D^9 to the lever E^4 , which lever is connected by the connecting-rod E^3 to the tiller E^2 , fast to the shaft E' , to which both of the immersion-rudders are secured. (See Figs. 1, 5 and 5^a.) Thus it will be seen that the piston C' is acted upon by two forces—one, the pressure of the water tending to press the cylinder down; the other, the tension of the spring D^2 tending to push the piston up. If this spring be set at the desired tension corresponding to a predetermined depth pressure of the water, the diving-rudders may be kept horizontal at that depth and may be caused by the pressure of the water or of the tension of the spring to swing about the shaft E' , thus causing the tail of the torpedo to be pressed down or up, as the case may be, with the corresponding rising or descending of the torpedo relative to the surface of the water.

I am aware that somewhat similar constructions have been used for regulating the depth of the immersion of automobile torpedoes, in which the opposing forces of the pressure of the water and of the tension of a spring control the action of the diving-rudders; but I believe that the hereinbefore-described construction is simpler in its construction, more efficient in its action, and more readily adjusted than others now in use.

Having thus explained the action of the apparatus by means of which the diving-rudders are controlled, I next proceed to the description of the mechanism whereby the torpedo is propelled. This mechanism is most clearly shown in Figs. 3 and 4. The air-flask B is provided with an outlet-pipe F, controlled by the reducing-valve F^3 , which valve is thrown into operation by the trigger G when the torpedo is launched and is kept open for a predetermined length of time by means of the clockwork mechanism H, when it is automatically closed by means of the spring G' . This clockwork mechanism is only used in trials of the torpedo where it is desired to limit its run, and thus more conveniently recover the torpedo when it floats to the surface after it has stopped running; but this clockwork mechanism in actual warfare might be omitted and the valve allowed to remain open until the torpedo is run down from the exhaustion of its supply of compressed air. Moreover, this clockwork mechanism not being a part of my present invention will not be further described herein. This pipe F opens into two branch pipes F' , forming two nozzles F^2 for compressed air, which nozzles open into the air-passages m in the turbine M, which turbine is mounted in the casing K, connected by the casing K' to the escape-pipes K^2 , which deliver the air after it passes from the engine to the water in rear of the torpedo, and thus help to push the torpedo ahead. The turbine is mounted on a shaft N' , which carries the propeller N. This shaft is journaled in suitable bearing-blocks K^3 K^4 , and its rear end n is hardened to bear against a thrust-bearing screw N^2 , made of hardened steel, or a piece of hardened steel may be inserted in the front end of the propeller-shaft to bear against the hardened screw. This construction diminishes the friction and lessens the wear.

In the modification shown in Fig. 9 two turbine-wheels M and M' are used having the vanes running in opposite directions, as is well known in the construction of compound turbines. The passage through the vanes is expanding, as shown, and the air after leaving the second turbine-wheel passes through the pipes K² and out astern of the torpedo, as at k². This pipe K² may be of any suitable shape so as, where water-borne, to reduce the resistance of the water, and the end k² may be flared out if desired to give a larger bearing-surface on the water of the escaping air. The forward turbine-wheel M is mounted on a shaft N', generally similar to that already described with reference to Fig. 3, and on this shaft N' the rear propeller N is secured. The forward propeller N³ is mounted on a hollow shaft N⁴, which is in the form of a sleeve and slips over the inner propeller shaft. The blades of the propellers N and N³ have their pitch reversed, so that they may be driven in opposite directions. By having two propellers, one astern of the other and rotating in opposite directions, the tendency of either propeller to slue the tail of the torpedo laterally, due to difference of pressure of the water corresponding to the depth of the blade, is largely obviated. Thus it will be seen that I provide a compound turbine operated by compressed air and driving two propellers in reverse directions, while the air after passing through the turbine passes out with the water astern of the torpedo, and hence assists in the propulsion thereof. In order to keep the inner shaft well lubricated, the annular space between the two propellers may be filled with any suitable lubricant, such as graphite and oil. A hole n⁴ is provided for this purpose.

The construction of the torpedo shown in Fig. 9 is generally similar to that described with reference to the other figures. By having the driving engine or engines in the form of a turbine fast on the propeller-shaft a very high speed of the propeller is secured and a consequent high speed of the torpedo, and, moreover, a lighter engine can be used, thus enabling the torpedo to carry more
 873 compressed air and more explosive than if a heavier engine were used. Again, by having a turbine-engine instead of the reciprocating engine ordinarily used in automobile torpedoes less vibration and smoother running is secured.

While I have described compressed air as motive power for the engine, it will be obvious that any other compressed gas may be used.

Since gas in expanding cools, with corresponding loss of power, I preferably mount the casing K in a water-chamber in which water freely flows from the outside of the torpedo, as through the openings a², which water thus serves to warm up the said casing, and with it the compressed air operating the turbine. For this purpose I provide bulkheads A³, A⁴, and A⁵, which form a water-chamber for the turbine and the air-pipes leading thereto. The same source of power that drives the turbine also drives the steering-engine, whose operation will now be described.

The steering-rudders O are connected to a common shaft O', which is bent over the propeller-shaft in form of a crank O², connected by

the connecting-rod O^3 to the crank O^4 on the shaft O^5 , which carries the lever O^6 , connected at each end to one of the piston-rods P of the steering-engine. (See Fig. 8.) These piston-rods are connected to the pistons P' in the cylinders P^2 , which cylinders are provided with passages p^2 and p^3 , respectively, leading to the valve, and p^4 , leading to the atmosphere or exhaust, (see Fig. 6,) and f^0 , leading to the air-supply.

The plug-valve Q is mounted in a casing Q' , and the valve and its casing are provided with suitable passages whereby fluid-pressure from the pipe F^0 , connected to the pipe F , will be admitted to either cylinder and at the same time the other cylinder will be connected to the exhaust. Thus these cylinders, which are single-acting, are operated alternately according to the position of the valve Q . This valve is carried on a valve-stem Q^2 , which forms one of the journal-bearings of the outer gimbal-ring R of the gyroscope-governor, which will now be described. The opposite side of this gimbal-ring R is journaled, as at r , in the arm S' of the bracket S , which bracket is fast to the shell of the torpedo. In this outer ring R of the gyroscope is journaled the inner ring R' , and in this inner ring the fly-wheel R^2 is journaled, as by means of the adjustable screw r' engaging the ends of the shaft r^2 of the fly-wheel R^2 . This shaft r^2 carries a pinion R^3 , normally meshing in the spur-gear U' , which is splined, as at u' on a shaft U , as shown in detail in Fig. 3^a. This gear U' is provided with a collar u , over which engage the arms t' of the nut T' , which nut engages the screw-threads u^0 on the exterior of the shaft U . The gear-wheel U' is adapted to slide on the shaft U , but is held against turning thereon, as shown in Fig. 3^a, where u' shows a spline on the shaft U . The nut is also pivotally connected to the lever T , which lever is pivoted at t^0 to the bracket S and is provided with a socket t to receive the head of one of the pins r' , as shown in Fig. 3, whereby the axis of the fly-wheel is normally held in a fixed position relative to the axis of the torpedo.

The shaft U is reduced, as at U' , to receive the hub u^2 of the box U^2 , containing the coil-spring V . One end of this spring is made fast to this box U^2 , and the other end of the spring is made fast to the sleeve w , which is loosely mounted on the hub u^2 of the box U^2 . This sleeve w carries the bevel-gear W , which meshes with the bevel-pinion W' on the shaft W^2 , which is wound up from the exterior by means of a key fitting over the squared head w^2 . (Shown in dotted lines in Fig. 3.) The shaft U is journaled in the arms S^3 and S^4 of the bracket S , and the shaft W^2 is journaled in the arm S^5 of said bracket. Pivoted to said arm S^5 is a lever X , which has a catch x' engaging in the teeth u^{20} on the exterior of the spring-box U^2 . This catch x' is normally thrown into engagement with the said teeth by means of the rod X' and the spring X^2 , which bears against a collar x^2 on said rod X' . The rod is continued down to the position indicated at x^3 , so that it may be pressed upward from the outside of the torpedo, thus releasing the said catch x' from the teeth u^{20} and allowing the spring V to unwind. This releasing the catch x' engaging in the teeth u^{20} on the exterior of the spring-box winding of the spring causes the screw u^0 on the shaft U to withdraw

the nut T' , thus withdrawing the notch t from engagement with the head r^3 of the screw r' , and at the same time the spur-gear U' is withdrawn from engagement with the pinion R^3 , and thus the wheel R^2 is spun up, and immediately thereafter the gyroscope is left entirely free from disturbing the forces, excepting the slight friction on the gimbals and the force required to turn the valve. The axis of the fly-wheel should be as nearly as practicable in the horizontal plane when the torpedo is launched, so as to secure the best directive effects. Thus it will be seen that the spur-gear U' may be caused to revolve through a few revolutions, thereby spinning up the fly-wheel, and is then withdrawn from engagement with the axis of the fly-wheel, thus leaving the gyroscope free to maintain its fixity of direction. The number of turns made by the spur-gear U' before it moves away from the pinion R^3 might be varied by varying the pitch of the screw-threads u'' . As the torpedo swerves to the right or left the valve will be held by the gyroscope in a substantially fixed direction, and thus

874 air will be admitted to one or the other of the cylinders P^2 , causing the torpedo to be steered in the opposite direction to that of its deflection, thus causing the torpedo to follow a sinuous course, but having a mean direction substantially the same as that with which the torpedo was first launched. The spring V is wound up by means of the shaft V^2 on the outside of the torpedo, as before described, and this shaft is prevented from turning backward after the spring has been wound up by means of any suitable ratchet-and-pawl arrangement, such as that shown at W^3 in Fig. 3.

Thus it will be seen that I have devised a simple mechanism easily operated from the exterior of the torpedo by means of which the gyroscope is spun up, and after the gyroscope is spun up it controls the steering-engine, having double cylinders with the valve located between the two, which cylinders alternately control the steering-rudders, and thus keep the torpedo on substantially the mean course toward the target.

It will be obvious that various means for causing the torpedo to run at a predetermined direction relative to the true course may be provided, if desired.

Having thus described my invention, what I claim, and desire to secure by Letters Patent in the United States, is—

1. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel, comprising a pinion fast on the axis of said fly-wheel, a spur-gear meshing in said pinion, means for automatically moving said spur-gear longitudinally out of engagement with said pinion as its shaft revolves, and spring-controlled mechanism for rotating said spur-gear, substantially as described.

2. In an automobile torpedo, provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in

gimbal-rings for controlling said valve, and means for spinning up said fly-wheel comprising a pinion on the axis of said fly-wheel, a spur-gear meshing in said pinion, means for automatically moving said spur-gear longitudinally out of engagement with said pinion as its shaft revolves, and spring-controlled mechanism for rotating said spur-gear, with means automatically operated by the launching of the torpedo for setting in operation said spring-controlled mechanism, substantially as described.

3. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel, comprising a pinion on the fly-wheel axis, a shaft with screw-threads thereon, a spur-gear splined on said shaft and engaging said pinion, a nut held on said shaft and engaging said screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, and spring-controlled mechanism for rotating said shaft, substantially as described.

4. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel comprising a pinion on the axis of said fly-wheel, a shaft with screw-threads thereon, a spur-gear splined on said shaft and engaging said pinion, a nut held on said shaft and engaging said screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, and spring-controlled mechanism for rotating said shaft, with means automatically operated by the launching of the torpedo for setting in operation said spring-controlled mechanism, substantially as described.

5. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel, comprising a pinion on the fly-wheel axis, a shaft with screw-threads thereon, a spur-gear splined on said shaft and engaging said pinion, a nut held on said shaft and engaging said screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, spring-controlled mechanism for rotating said shaft, with means for holding the axis of the fly-wheel in a fixed direction relative to the axis of the torpedo, and means automatically operated by the rotation of said shaft for releasing said axis, substantially as described.

6. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gim-

bal-rings for controlling said valve, and means for spinning
875 up said fly-wheel comprising a pinion on the axis of said fly-wheel, a shaft with screw-threads thereon, a spur-gear splined on said shaft and engaging said pinion, a nut held on said shaft and engaging said screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, spring-controlled mechanism for rotating said shaft, with means automatically operated by the launching of the torpedo for setting in operation said spring-controlled mechanism, with means for holding the axis of the fly-wheel in a fixed direction relative to the axis of the torpedo, and means automatically operated by the rotation of said shaft for releasing said axis, substantially as described.

7. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel, comprising a pinion on the fly-wheel axis, a shaft with screw-threads thereon, a spur-gear splined on said shaft and engaging said pinion, a nut held on said shaft and engaging said screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, spring-controlled mechanism for rotating said shaft, a lever connected to said nut for holding the axis of the fly-wheel in a fixed direction relative to the axis of the torpedo, and automatically moved by the rotation of said shaft thus releasing said axis when the wheel is spun up, substantially as described.

8. In an automobile torpedo provided with steering-rudders, the combination with a steering-engine operating said rudders, of an air-flask and connections for supplying fluid-pressure to said engine, a valve for controlling said fluid-pressure, a fly-wheel mounted in gimbal-rings for controlling said valve, and means for spinning up said fly-wheel, comprising a pinion on the axis of said fly-wheel, a shaft with screw-threads thereon, a fly-wheel splined on said shaft and engaging said pinion, a nut held on said shaft and engaging the screw-threads and automatically moving said spur-gear longitudinally out of engagement with said pinion as said shaft revolves, spring-controlled mechanism for rotating said shaft, with means automatically operated by the launching of the torpedo for setting in operation said spring-controlled mechanism, and means automatically operated by the rotation of said shaft for releasing said axis, a lever connected to said nut for holding the axis of the fly-wheel in a fixed direction relative to the axis of the torpedo, and automatically moved by the rotation of said shaft thus releasing said axis when the wheel is spun up, substantially as described.

9. In an automobile torpedo, the combination with an air-flask containing air or other gas under pressure, of a steering-engine comprising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one

cylinder and to permit exhaust from the other cylinder, a gyroscope for holding said valve in a substantially steady position irrespective of the lateral swervings of the torpedo, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering engine, substantially as described.

10. In an automobile torpedo, the combination with an air-flask containing air or other gas under pressure, of a steering-engine comprising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one cylinder and to permit exhaust from the other cylinder, a gyroscope for holding said valve in a substantially steady position irrespective of the lateral swervings of the torpedo, means for holding said gyroscope with its axis in a constant direction relative to the axis of the torpedo, and means for automatically spinning up said gyroscope and for releasing its axis, allowing it free motion when the torpedo is launched, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

11. In an automobile torpedo, the combination with an air-flask containing air or other gas under pressure, of a steering-engine comprising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one cylinder and to permit exhaust from the other cylinder, a fly-wheel journaled in gimbals having its axis horizontal and its outer gimbal-ring secured to said valve at one of its pivots, means for normally holding the axis of said fly-wheel in a fixed direction relative to the axis of the torpedo and for releasing same when desired, and means for automatically spinning up the fly-wheel when the torpedo is launched, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

12. In an automobile torpedo, the combination with an air-
876 flask containing air or other gas under pressure, and a rotary engine driven thereby for propelling the torpedo, of a steering-engine comprising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one cylinder and to permit exhaust from the other cylinder, a gyroscope for holding said valve in a substantially steady position irrespective of the lateral swervings of the torpedo, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

13. In an automobile torpedo, the combination with an air-flask containing air or other gas under pressure, and a rotary engine driven thereby for propelling the torpedo, of a steering-engine com-

prising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one cylinder, and to permit exhaust from the other cylinder, a gyroscope for holding said valve in a substantially steady position irrespective of the lateral swervings of the torpedo, means for holding said gyroscope with its axis in a constant direction relative to the axis of the torpedo, and means for automatically spinning up said gyroscope and for releasing its axis, allowing it free motion when the torpedo is launched, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

14. In an automobile torpedo, the combination with an air-flask containing air or other gas under pressure, and a rotary engine driven thereby for propelling the torpedo, of a steering-engine comprising two cylinders connected to said air-flask, a valve mounted between said cylinders and adapted to supply fluid-pressure to one cylinder and to permit exhaust from the other cylinder, a fly-wheel journaled in gimbals having its axis horizontal and its outer gimbal-ring secured to said valve at one of its pivots, means for normally holding the axis of said fly-wheel in a fixed direction relative to the axis of the torpedo and for releasing same when desired, and means for automatically spinning up the fly-wheel when the torpedo is launched, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

15. In an automobile torpedo, the combination with an air-flask containing air or gas under pressure, of a steering-engine comprising a casing containing two cylinders, each cylinder open at one end and also connected to said air-flask by passages in said casing, a valve mounted in said casing between said cylinders and adapted to supply fluid-pressure to one cylinder and to permit exhaust from the other cylinder, a gyroscope for holding said valve in a substantially steady position irrespective of the lateral swervings, pistons in said cylinders provided with piston-rods, steering-rudders pivoted to the torpedo, and a series of levers connecting said piston-rods with said rudders for turning said rudders by means of said steering-engine, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS HENRY WHELESS.

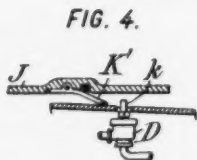
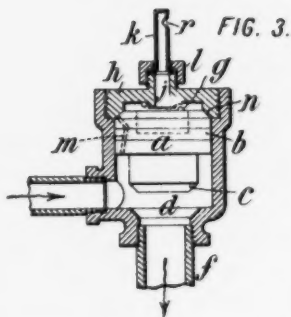
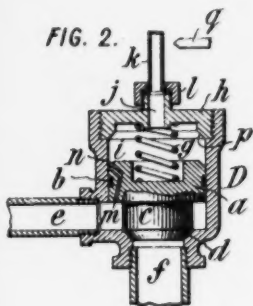
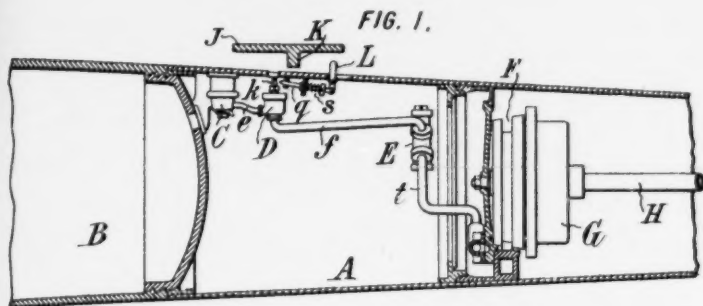
Witnesses:

JAS. H. BLACKWOOD.
M. M. O'CONNOR.

No. 880,030.

PATENTED FEB. 25, 1908.

F. M. LEAVITT.
 STARTING VALVE FOR AUTOMOBILE TORPEDOES.
 APPLICATION FILED FEB. 18, 1907.



WITNESSES:

Fred White
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By Attorneys.

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DEFENDANT'S EXHIBIT 147.

United States Patent Office.

Frank M. Leavitt, of New York, N. Y., Assignor to E. W. Bliss Company, of Brooklyn, New York, a Corporation of West Virginia.

Starting-Valve for Automobile Torpedoes.

No. 880,030.

Patented Feb. 25, 1908.

Specification of Letters Patent.

Application Filed February 16, 1907. Serial No. 357,630.

To all whom it may concern:

Be it known that I, Frank M. Leavitt, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Starting-Valves for Automobile Torpedoes, of which the following is a specification.

This invention relates to improved means for opening a valve for admitting fluid under pressure from the source of supply thereof to the engine or motor upon the launching of a torpedo.

According to this invention the valve prior to launching is held closed by pressure confined in a chamber or space which is in communication with a frangible part which is adapted to be broken in the act of launching the torpedo, so that the pressure escapes from said space and the valve is thereby released and permitted to open. Preferably it is opened by the pressure of the compressed air or other fluid from the reservoir. Preferably the frangible part is a cap or capsule of easily broken metal which is either fractured by contact with a projection in the launching tube, or is broken or cut independently by some intermediate moving part which is displaced by contact with some part of the launching tube.

(Here follows diagrams marked page 878.)

Figure 1 of the accompanying drawings is a vertical mid-section of a portion of an automobile torpedo illustrating a suitable application of my invention; Figs. 2 and 3 are vertical sections of the starting valve in its preferred form showing it respectively in closed and opened positions; Fig. 4 is a fragmentary view corresponding to Fig. 1, but showing a modification.

Referring to the drawings, let A designate the shell or hull of an automobile torpedo, of which B is the compressed air reservoir or air flask, C is any usual filling or charging valve, D is the starting valve, E may be a pressure reducing valve or an emergency stop valve, F is the engine, which in the present instance is shown as a turbine, G is a fixed casing which in the case of a turbine engine is employed as a housing for the speed reducing gearing, and H is a fragment of the propeller shaft. •

At J is shown a fragment of the launching tube having any suitable inward projection K.

L is an outward projection on the torpedo which as the latter moves within the launching tube preparatory to launching encounters the projection K as a means of operating the starting valve. The movable projection L consequently takes the place of the starting valve hook in the ordinary Whitehead torpedo.

The starting valve D consists of a suitable shell in which is arranged a movable part *a*, such as a piston or its equivalent. Preferably the shell is formed with a cylindrical chamber, and the part *a* is constructed as a piston with if desired any suitable piston packing *b*. The piston *a* carries or is otherwise suitably connected to a valve proper *c*, which may be a tappet or cone valve adapted to seat upon a seat *d*, and thereby as shown in Fig. 2 cut off communication between the inlet *e* and the outlet *f*. A spring *g* is provided to initially press the valve to closed position. Preferably the shell is made with a removable top or cap *h* so that access may be had to the inclosed parts. In communication with the chamber *i* above the piston *a* there is an outlet or escape passage *j* for communication with a frangible part *k*. This part is best constructed as a flanged cap or capsule of drawn sheet metal such as copper or brass. This capsule is united to the valve shell in air-tight manner by any convenient means, such for example as a screw coupling or union *l*. Provision is made for admitting fluid under pressure to the chamber *i*, which is conveniently accomplished by drilling a minute hole or duct *m* through the piston *a* as shown, or in any other manner by which fluid under pressure may flow restrictedly from the inlet *e* to the chamber *i*. Preferably this duct opens into the chamber *i* at such point that when the valve is wide open so that the piston *a* seats against a stop shoulder, the duct *m* shall thereby be closed; this I preferably accomplish by causing the duct to open through a conical portion *n* of the piston which closes against a corresponding conical seat *p* in the valve shell.

Any suitable means is arranged for breaking or puncturing the frangible part or capsule *k*. As an example of such means the drawings show a knife *q* arranged adjacent thereto and to which in any suitable way is imparted a movement upon or just before the launch-

ing of the torpedo, so that the knife is caused to cut or puncture the frangible part, thus making an opening therein as shown at *r* in Fig. 3, and permitting the escape of compressed fluid therefrom. As shown in Fig. 1 the knife *q* is connected to the projection *L* so as to be advanced when the projection is moved by encountering the fixed projection *K* in the launching tube. A spring *s* is shown to hold the parts normally in the inactive position. The projection *L* is shown as a lever one arm of which projects externally, while its opposite arm is connected to the knife *q*.

In operation, the reservoir *B* is first charged with compressed air or other fluid through the valve *C*, which is closed until just before the launching; in preparation for the launching operation the valve *C* is opened, thereby admitting compressed air through the tube *e* to the starting valve *D*. This starting valve is already held closed by spring *g*. Upon the admission of compressed air the latter enters under the piston and flows through the duct *m* into the chamber *i* above the piston, which it quickly fills and establishes therein an equal pressure to that beneath, whereby the valve is held closed and pressed upon its seat with a pressure proportional to the relative areas of the upper side of the piston and the annular lower part thereof exterior to the valve *c*. To launch the torpedo it is placed in the launching tube and expelled therefrom by gaseous pressure in the well known manner. As soon as the torpedo has moved far enough to bring its projection or lever *L* into contact with the projection *K*, this lever commences to turn and it quickly thrusts the knife *q* against the capsule *k*, thereby puncturing or rupturing the latter and permitting an escape of compressed air from the chamber *i*, thus the pressure holding the valve closed is relieved, and as this escape can occur more rapidly through the orifice *r* than air can enter through the restricted duct *m*, the pressure above the piston instantly falls so low that the pressure against its annular portion beneath exceeds the pressure above it, so that the piston is forced up, thereby unseating its valve *c* and establishing a flow of the compressed air through the starting valve to the engine, this flow occurring through the tube *f*, the valve *E* and the tube *t*. The valve thus opens instantly and is stopped by the piston seating against the seat *p*, which closes the duct *m* and prevents leakage of compressed air from the valve through the broken capsule. The starting valve consequently receives beneath it the entire pressure of the compressed air which is flowing to the engine, by which it is held open during the entire period of the run of the torpedo. Before another run of the torpedo can be made, it is necessary to remove the broken capsule and substitute a new one. The valve closes by its spring *g* upon the relief of the pressure beneath it.

The frangible part *k* may be variously constructed. It need not be in the form of a cap or capsule, but may be any septum or partition which is capable of withstanding the heavy pressure employed, and is puncturable or fracturable with sufficient ease to enable it to be cut or broken by the action of any suitable device against it in the operation of launching. Although a metal part is preferable for this

purpose, yet the frangible part may be of other materials. The use of a frangible part according to my invention has the important advantage that when once cut or broken it insures that the valve shall remain open during the remainder of the operation. Its use also affords a practical assurance against accidental or premature opening of the starting valve.

A modified means for breaking or cutting the part *k* is shown in Fig. 4. Here the launching tube instead of a fixed projection *K*, has a movable knife or cutter *K'*, and the starting valve *D* is arranged with its frangible capsule *k* projecting sufficiently beyond the hull of the torpedo to be cut by the knife *K'* during the launching movement. Otherwise the construction and operation do not differ from that already described.

The details of construction of the starting valve may be greatly varied without departing from the invention. The construction shown is the simplest and most perfect embodiment of my invention which I have been able to devise, but I do not limit myself to the use of the details or constructive features shown, nor exclude the application of my invention with other or equivalent or more complicated devices.

I claim as my invention:—

1. A starting valve for automobile torpedoes comprising a pressure-actuated part receiving a gaseous pressure tending to hold the valve closed, a frangible part confining such pressure, and means for breaking or puncturing such frangible part to permit an escape of such pressure, in substantially the manner set forth.

2. A Starting valve for automobile torpedoes comprising a valve shell, a movable part therein, means for admitting pressure to a chamber on one side of said part to hold the valve closed, a frangible part in communication with said chamber and serving to confine such pressure, and means for breaking or puncturing the frangible part to permit an escape of pressure from said chamber.

3. A starting valve for automobile torpedoes comprising a valve shell, a piston and valve proper movable therein, an air inlet to one side of said piston, a restricted duct for communicating pressure from said inlet to a chamber on the opposite side of the piston, and a frangible part communicating with said chamber and
881 & 882 confining the pressure therein.

4. A starting valve for automobile torpedoes comprising a valve shell, a movable part and valve proper therein, an inlet opening, a restricted duct permitting pressure from said inlet to a chamber on the opposite side of said moving part, opening into said chamber at a seat adapted to close by the opening movement of the valve, and a frangible part in communication with said chamber and confining the pressure therein.

5. A starting valve for automobile torpedoes comprising a valve shell having an inlet, a valve seat and an outlet, a piston and attached valve movable therein, means for admitting a restricted flow from the inlet to a chamber on the opposite side of said piston in which the pressure acts against the entire area of the latter, and a

frangible part in communication with said chamber and confining the pressure therein.

6. A starting valve for automobile torpedoes comprising a pressure-actuated part receiving a gaseous pressure tending to hold the valve closed, a frangible part confining such pressure consisting of a projecting cap or capsule, means for detachably uniting it, and means for breaking or puncturing it to permit an escape of pressure.

7. An automobile torpedo comprising a starting valve having a frangible part for confining pressure therein, combined with a launching tube having means for breaking or puncturing said frangible part during the launching movement of the torpedo.

8. An automobile torpedo comprising a starting valve having a frangible part for confining pressure therein, combined with a launching tube having an internal projection, and means in connection therewith for breaking or puncturing said frangible part during the launching movement of the torpedo.

9. An automobile torpedo comprising a starting valve having a frangible part for confining pressure therein, and having a movable knife, and an externally projecting part adapted on displacement to move said knife for puncturing said frangible part, combined with a launching tube having means for displacing said projecting part during the launching movement of the torpedo.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

M. ARONSON.

ARTHUR C. FRASER.

883

DEFENDANT'S EXHIBIT 155.

[Second Edition.]

No. 18,241. [Cut.] A. D. 1908.

Date of Application, 31st Aug., 1908—Accepted, 25th Feb., 1909.

Complete Specification.

Improvements in Apparatus for Increasing the Working Efficiency of Compressed Air and Gas Motor Plants.

I, Johann Gesztesy, of Pola, Austria, Imperial and Royal Line-ship Lieutenant, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

Methods of and apparatus for increasing the working capacity of compressed air motors, particularly those employed for automobile torpedoes, have already been described in which the compressed air (its pressure being maintained meanwhile), is mixed with a finely divided liquid fuel and the latter ignited in a special heating chamber, in which a continuous combustion takes place during the working of the motor by the fall of pressure produced thereby. In this method of working the actual quantity of fuel burnt is accurately limited by the introduction of a definite quantity of fuel, below the original pressure of the compressed air, after which the gases of combustion are mixed with steam, which is produced by the introduction of water into the heating chamber and this high pressure mixture reduced down to working pressure.

It has also been heretofore proposed to arrange automatic pressure retarding apparatus between the compressed air reservoir and the motor, the characteristic feature of such apparatus being that in a casing connected to the compressed air pipe there are placed two movable pistons which are connected with each other and acted upon by spring pressure and of which the larger one acts as a brake piston, while the smaller one comprises a cylindrical portion adapted to close the opening for the passage of the air and a conical portion which projects upwardly into the compressed air entrance chamber. This conical portion is pressed down onto its seat by the spring and also by the compressed air, which fills the whole of the compressed air pipe when the compressed air is admitted to the apparatus, while, as soon as the pressure of the air in the pipe leading to the motor falls, owing to the starting of the motor, the piston is shifted against the action of the spring and the brake piston, by the compressed air acting upon its other side so that after its cylindrical portion has completely emerged from the passage opening the conical portion opens the way for the passage of the air to a greater or less extent according to its position.

Now the object of this invention is to provide an improved or more perfect construction of apparatus of this type.

In a complete torpedo plant embodying the improved apparatus the working is as follows:—

1. The pressure in the compressed air heating apparatus is reduced to such an extent at the commencement, after starting the motor, that the rise of pressure effected by the first ignition of the charging mixture is never such as to exert any injurious effects on the motor.

2. The pressure after ignition has been effected is gradually raised so that the motor is gradually started in a way that obviates injuriously effecting it.

3. The relative times of the commencement of the supply of fuel and water, as well as of the actuation of the igniting device are so regulated that they follow each other in such order as to ensure satisfactory working.

4. Finally, should the torpedo accidentally turn over during the preliminary manipulation therewith, the improved apparatus prevents the fuel or the water from running out of the corresponding reservoirs into the pipe or into the heating apparatus and so into the engine.

All these conditions in working can be attained in a simple way by a pressure retarding device constructed as regards its essential features substantially as the one before indicated, as heretofore proposed, but the improved apparatus constructed according to this invention is also adapted to at the same time suitably control the supply of air, fuel and water.

Fig. 1 of the accompanying illustrative drawings is a general representation of a compressed air motor plant for a torpedo.

Figs. 2, 3, 4 and 5 show the pressure retarding and controlling apparatus in vertical longitudinal section, plan, part side elevation and vertical section corresponding to the line $x-x$ of Fig. 3, respectively.

1 is the compressed air reservoir from which a pipe 2 leads to the starting valve 3 that is connected by a pipe 4 to the pressure regulator 5.

A pipe 6 places the pressure regulator 5 in communication with the pressure retarding and controlling apparatus 7, from which the compressed air passes through a union 8 into the heating apparatus 9.

The heating apparatus 9 and the fuel supplying and igniting apparatus may be constructed as described in the Specification of Letters Patent No. 7390 of 1906, that is to say it comprises a casing mounted upon the fuel reservoir 10 and in which a vessel 11 surrounding the combustion chamber and open at the top is so placed that an annular space 12 is left all round it between it and the wall of the chamber. This vessel 11, which, for the purpose of intimately mixing the fuel with the compressed air may be provided with a perforated partition, tapers at the bottom into a cylindrical portion 14 of reduced diameter surrounded by an enlarged annular space 13 and mounted upon the fuel reservoir 10, and projecting

upwardly into this portion 14 is an ascension pipe 15 that depends nearly to the bottom of the fuel reservoir 10 and the upper end of which carries a cylindrical head 16 formed with radial holes 17. The head 16 extends nearly to the wall of the surrounding portion 14 and in a way divides the vessel 11 into two parts connected by the narrow annular space around the head 16. The lower part of the vessel 11 communicates by holes 18 with the annular space 12 into which the union 8 opens. Upon the outside of the casing of the heating apparatus is an annular passage 19 which communicates by a pipe 21 with the water reservoir 20 and by small holes in the casing with the annular space 12 surrounding the vessel 11.

22 is the ignition device to be set in operation by the compressed air and which by means of the pipe 23 communicates with a pressure retarding apparatus and controlling device 7 constructed according to this invention. This apparatus 7 also communicates by means of a pipe 24 with the water reservoir 20 and by means of a pipe 25 with the fuel reservoir.

26 is a pipe leading to the motor.

If the fuel reservoir 10 be charged with fuel and the starting valve 3 be opened compressed air will flow through the pipes 2 and 4, through the pressure regulator 5 and through the pressure retarding device and controlling apparatus 7 (to be hereinafter described) into the heating apparatus where it fills the chambers thereof. It passes also through the pipe 25 into the fuel reservoir 10 and drives fuel through the ascension pipe 15 and upwardly through the radial perforations 17 in the body 16 where it mixes with the compressed air and is ignited by the ignition apparatus 22 which is likewise set in action by the compressed air through the pipe 23. Water is simultaneously forced out of the reservoir 20 through the pipe 21 into the annular passage 19, thence through the holes in the casing of the heating apparatus into the annular passage 12, where it is broken up into a fine state of subdivision by the compressed air flowing through, and mixed therewith. In the upper part of the heating apparatus this mixture meets with the outgoing hot gases of combustion with which it mixes, the atomised water being simultaneously converted into steam, and the mixture which finally results is supplied to the motor for the performance of work.

In order to regulate the method of working herein described, particularly when starting the motor, the improved pressure retarding apparatus and controlling device 7, shown to a larger scale in Figs. 2, 3, 4 and 5 is constructed as follows:—

The apparatus comprises two superposed cylindrical casings 27 and 28, which are separated from each other by a partition 29 formed with a central hole. In each of the two casings 27 and 28 is inserted a somewhat tightly fitting piston 30 and 31 respectively, which are connected to each other, either rigidly or flexibly, by a piston rod 32 which passes through the central hole in the partition 29. Underneath the lower piston 31 is placed a powerful helical spring 33 by the force of which both pistons are constantly forced upwardly. The space below the piston 31 is also filled with a fluid

that retards downward movement of such piston which is formed with a small passage 34 through which the fluid is forced on the downward movement of the piston.

The upper casing 27 is provided with two large branches 35 and 36 and three smaller branches 37, 38 and 39 which open into the interior of the casing. The branch 35 serves for the admission of air and is therefore connected to the pipe 6, see. Fig. 1. The branch 36 which is at a slightly lower level serves for the outlet of air to the heating apparatus and is therefore connected to the pipe 8, see Fig. 1. Between these two branches 35 and 36 are placed at definite heights the three smaller branches 37, 38 and 39 which serve for the pipe connections to the fuel reservoir, the water reservoir and the ignition device respectively.

These three branches are so arranged that the openings therefrom leading into the casing 27 and completely shut off by the upper piston 30 when this piston is in its highest position, in which position however a small space remains between it and the upper end of the casing 27 and from this space above the piston a narrow passage 40 formed through the wall of the casing leads to the lower branch 36, so that even when the piston is in this position a portion of the compressed air can pass over from the branch 35 to the union 36.

When the apparatus is not in action the piston 30 effectually closes the two connecting pipes 8 and 24 to the fuel and water reservoirs so that when the torpedo is turned over during the manipulation therewith neither fuel nor water can pass through these pipes to the heating apparatus.

The length of the casing 27 is such that beneath the lower branch 36 there is sufficient room for the upper piston 30 when in its lower position to completely uncover the mouth of the branch 36. The lower part of the casing 27 is formed with two annular grooves 41 and 42 which are in communication with each other as by a longitudinal groove and the upper one of which communicates with the branch 36 by a longitudinal groove 43. The purpose of these grooves is to allow compressed air which gradually gets under the piston 30 owing to its not being perfectly tight to escape again and to ensure that the air underneath the piston 30 shall always be at the same pressure as that emerging from the branch 36 whereby a difference of pressure is produced which keeps the piston in its lowest position during the whole run of the torpedo.

On opening the starting valve 3 the compressed air passes as heretofore stated through the regulator 5 to the retarding device 7 and at first, owing to the position of the piston 30, only a small part of the compressed air will pass, through the passage 40 and branch 36 into the pipe 8 and into the heating apparatus. By the continued pressure of the air however the two pistons 30 and 31 of the retarding apparatus are slowly forced downwardly, the lower piston acting as a brake piston. During this movement the three small branches 37, 38 and 39 are gradually opened so that the compressed air passes into the fuel reservoir 10 through the branch 37 and the pipe 25 whereby the supply of the fuel commences.

A moment later the compressed air also passes to the ignition

apparatus through the branch 39 and the pipe 23 thereby setting the ignition apparatus in action. In this way the ignition of the fuel, which has already passed into the heating apparatus, is effected at a relatively low pressure. Immediately afterwards the compressed air also passes through the branch 38 and the pipe 24 into the water reservoir 20 whereupon the supply of water to the heating apparatus also commences. Finally the piston 30 which still keeps on moving downwardly, gradually and completely uncovers the outlet 36 to the heating apparatus, the pressure in the heating apparatus gradually rising until the piston 30 reaches its lowest position. The piston 30 is then kept in this lowest position owing to there always being, in consequence of the longitudinal groove 43 and annular grooves 41 and 42, a somewhat lower pressure below it than there is above it so that the tension of the spring is overcome.

When the torpedo has concluded its run the starting valve 3 is closed automatically after which the pistons 30 and 31 are returned to their uppermost position by the pressure of the spring 33.

The constructional formation of the improved pressure retarding apparatus and controlling device obviously permits of numerous modifications while ensuring the above described method of working and without departure from this invention. Thus for example instead of the upper piston 30 another suitable controlling device, say a slide valve, could be employed operated by a piston which is subject to the pressure of the compressed air for the purpose of obtaining the desired automatic movement.

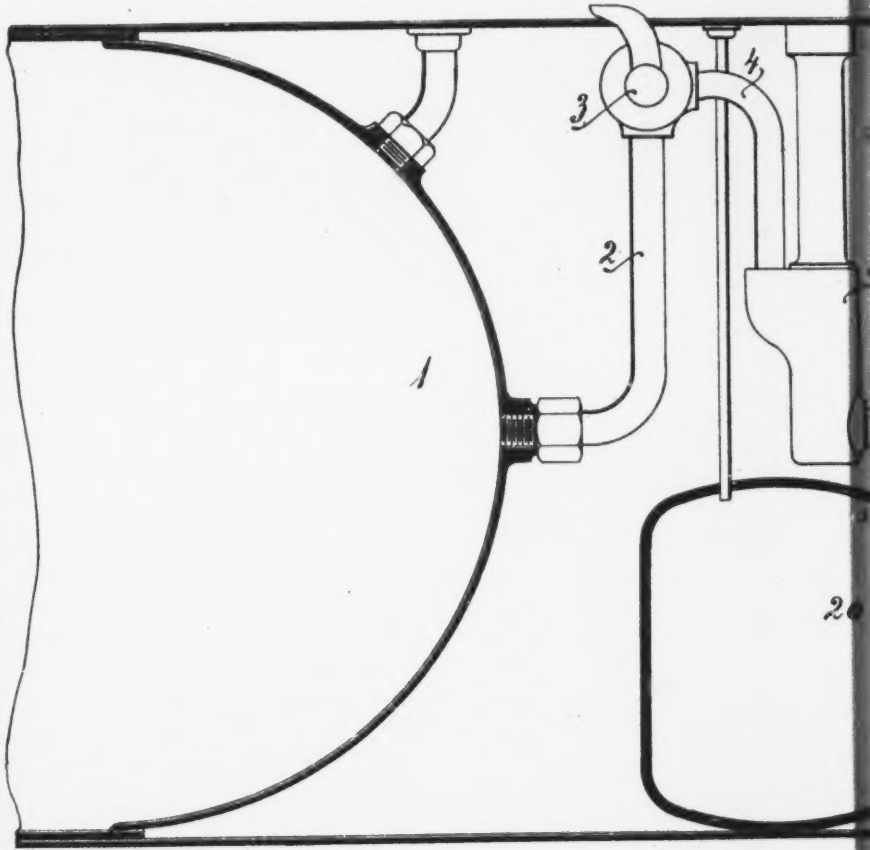
Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed I declare that what I claim is:—

1. Pressure retarding apparatus, for compressed air motor plants, of the kind wherein a piston valve, which is provided with a brake piston and acted upon by spring pressure or other controlling device acted upon by a piston, wholly or partially cuts off, when in its normal position, the outlet opening to the motor or to the compressed air heating apparatus, and, when it is displaced by the entering compressed air, gradually uncovers the outlet opening, characterised by the fact that the pipe connections with the fuel reservoir, the water reservoir, and the ignition device which is worked by compressed air, open into the piston valve casing in such way that when the piston valve or controlling device is in its normal position these connections are obstructed or shut off and are only gradually opened as the piston valve is moved by compressed air, so that the motor is started gently and without noise.

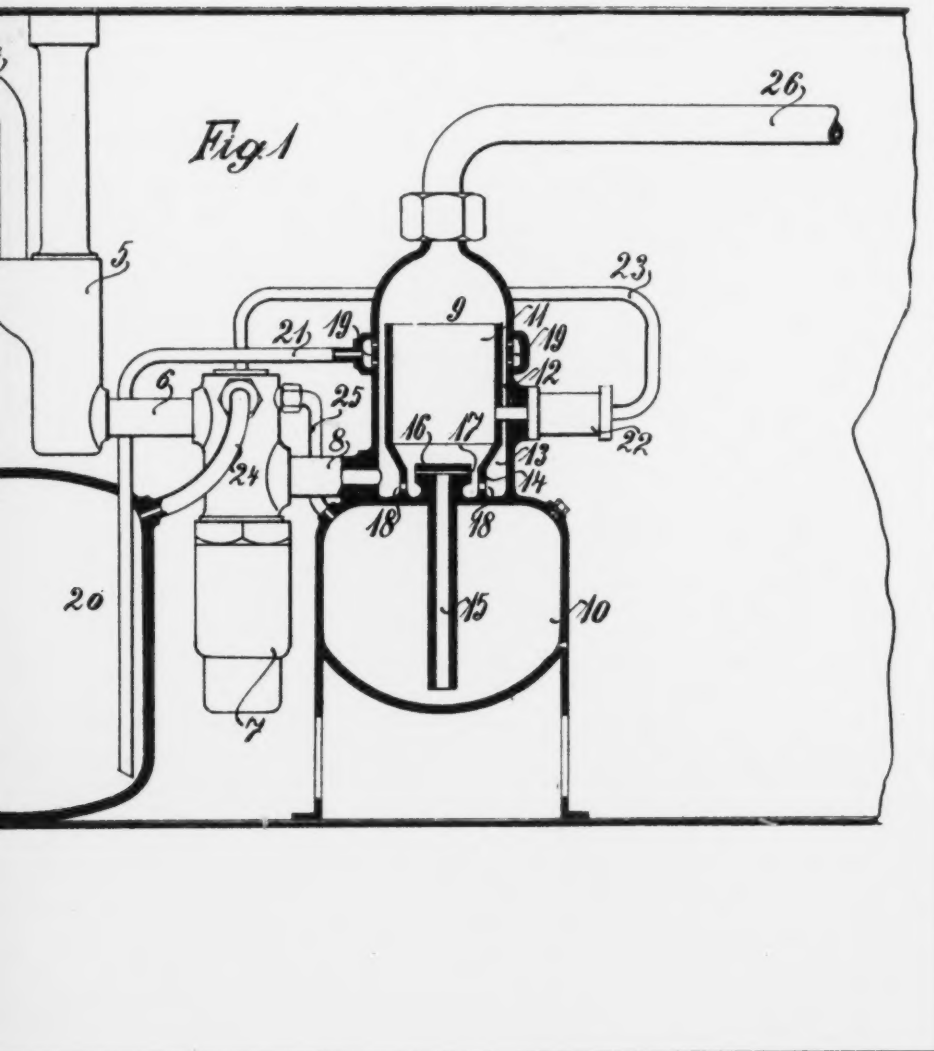
2. Pressure retarding apparatus according to Claim 1, in which the underside of the piston valve or of the piston acting upon the controlling device, constantly communicates with the compressed air outlet opening for the purpose of keeping up a constant difference of pressure on the two sides of the piston valve in order to overcome the spring pressure and by this means to keep the piston in its lowest position during the entire run of a compressed air driven torpedo fitted with the apparatus.

3. Pressure retarding apparatus for compressed air motor plants

[3rd Edition]



[This Drawing is a full-size reproduction of the Original.]





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(3rd Edition)

Fig. 2

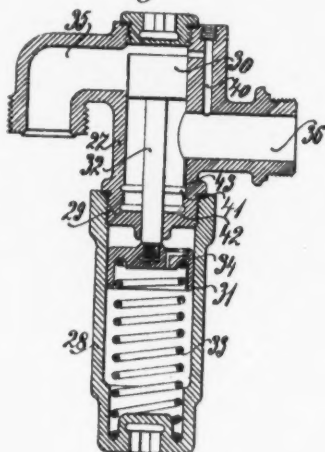


Fig. 4

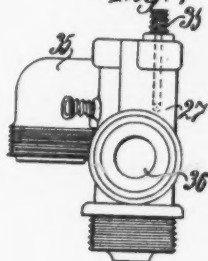


Fig. 5
 Schmitt & Co.

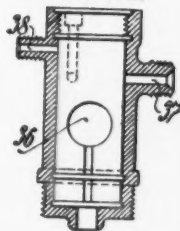
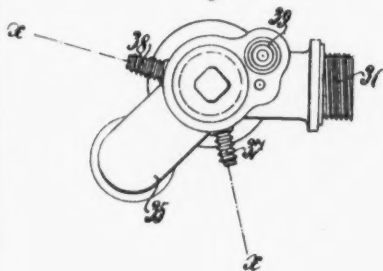


Fig. 3



[This Drawing is a reproduction of the Original on a reduced scale.]



of the kind referred to, constructed, arranged and operating substantially as hereinbefore described with reference to and shown in the accompanying drawings.

Dated this 31st day of August 1908.

For the Applicant, LLOYD WISE & CO.,
Chartered Patent Agents.

46 Lincoln's Inn Fields, London, W. C.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.

[Wt. 57—50/5/1910.]

(Here follow diagrams marked pages 887 and 889.)

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DEFENDANT'S EXHIBIT 156.

United States Patent Office.

John F. Brady, of Chicago, Illinois.

Steam-Turbine.

*Specification Forming Part of Letters Patent No. 634,938, Dated
February 20, 1900.*

Application Filed July 24, 1899. Serial No. 724,979. (No model.)

To all whom it may concern:

Be it known that I, John F. Brady, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Steam-Turbine, of which the following is a specification.

My invention relates to steam-turbines; but the same may be actuated by any gas under pressure.

My object is to provide a construction adapted to withstand and to utilize for power either steam or gas under very high pressures and in which the several revolving parts are not subjected to undue frictional contact on account of such high pressures.

Another object is to so arrange the operative parts that a turbine may be altered to several different sizes without increasing the diameter of the largest revolving parts upon which the steam operates, but by simply adding additional similar parts of the same diameter and increasing the length of the central shaft, as is hereinafter fully described, and illustrated in the accompanying drawings, in which—

(Here follow diagrams marked pp. 892 and 894.)

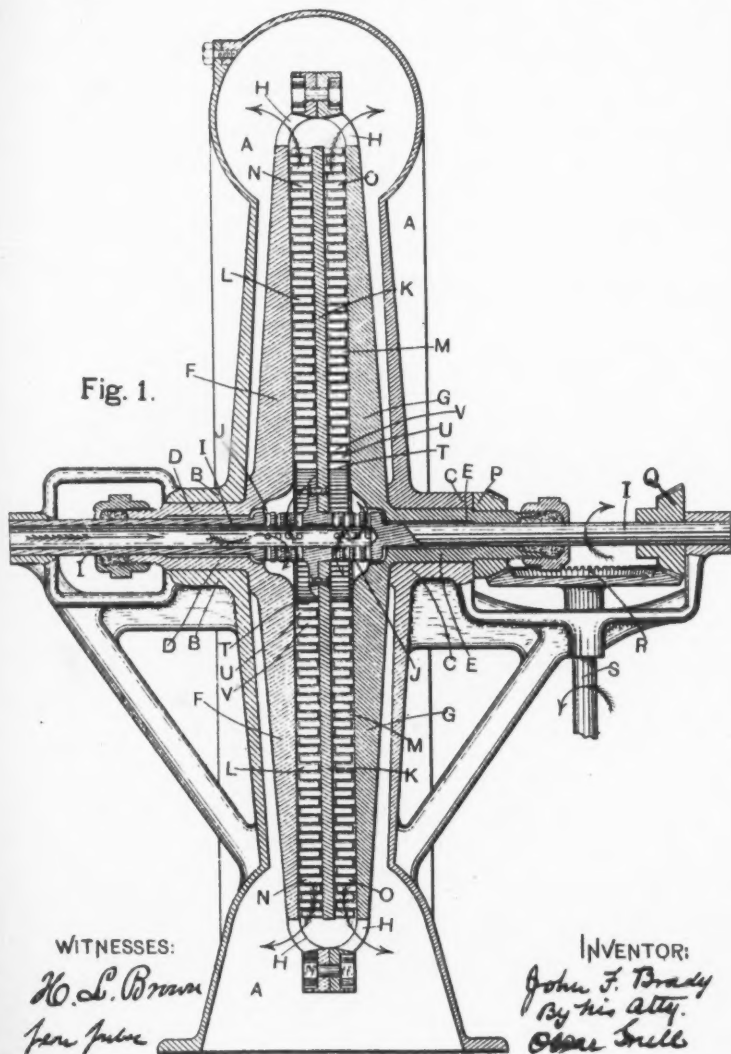
Figure 1 is an axial vertical section of the principal operative parts, together with the exhaust-steam case, broken away to an axial section in parts to illustrate manner of mounting the axial portion of the turbine centrally within the case, which latter serves also as a frame. Figs. 2, 3, and 4 are respectively outside, edge, and inside elevations of one of the turbine-disks and also illustrate the form of both of the outside turbine-disks, as is shown hereinafter. Fig. 5 is a side elevation of an inside turbine-disk looking in the direction indicated by arrow 9 in Fig. 6, which latter is an edge elevation of the inside turbine-disk, together with a side elevation of the central shaft, upon which it is mounted. Fig. 7 is a cross-section down

J. F. BRADY.
STEAM TURBINE.

Application filed July 23, 1899

(No Model.)

2 Sheets—Sheet 1





J. F. BRADY.
STEAM TURBINE.

Application filed July 23, 1899.

(No Model.)

2 Sheets—Sheet 2

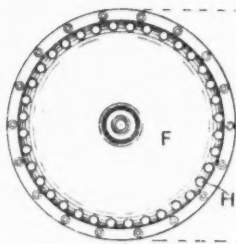


Fig. 2



Fig. 3

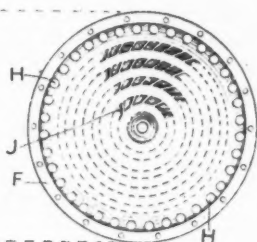


Fig. 4

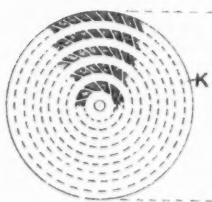


Fig. 5

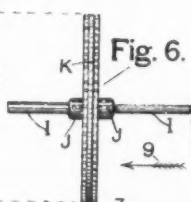


Fig. 6

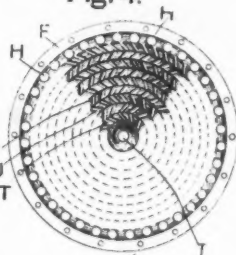


Fig. 7

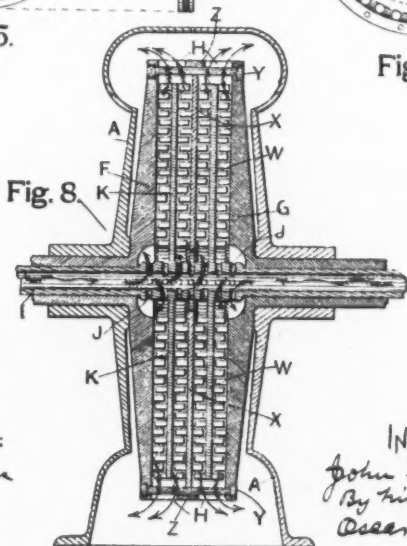


Fig. 8

WITNESSES:

H. L. Brown
John Brady

INVENTOR:

John F. Brady
By his atty
Deane Smith



through two series of vanes between two disks to illustrate the oppositely-inclined steam passage-ways formed by the vanes of the opposing disks when in proper operative position. Fig. 8 is a vertical axial section of a modification of the turbine illustrated in Fig. 1 to show method of increasing the size in order to develop more power by adding more vane-disks, as is herein more fully explained.

Similar letters indicate like parts throughout the several views.

The exhaust-steam case A, is a circular shell similar to what is used in an ordinary rotary blower, and at the axial portion thereof are bosses B and C, in which are mounted laterally-projecting journals D and E of the sides of the principal vane-disks F and G. In this instance vane-disks F and G are flanged at the peripheral edges and, being concave in shape, are bolted together around the margin, so as to leave a hollow chamber between them. All around the sides near the peripheral margins are exhaust-holes, as shown in Figs. 2, 4, and 7 at H, which lead out of the chamber into the interior of the case A.

Mounted through the journals D and E is a shaft I, which may be hollow throughout its entire length, as shown in Fig. 8, or through only a portion of its length, as shown in Fig. 1. At the central portion and between vane-disks F and G is a chamber in which shaft I is enlarged, and through this enlarged portion are a number of holes J, which serve as passage-ways for steam between the hollow portion of the shaft and the space between vane-disks F and G. Mounted upon shaft I and securely affixed thereto is a vane-disk K.

Projecting inwardly from each of the vane-disks F and G are circular rows of vanes, such as L and M, and projecting outwardly from each side face of vane-disk K are circular rows of vanes N and O, the rows of vanes in disk K being adapted to rotate between and in the same plane as the rows of vanes in disks F and G and the vanes in the disk K being disposed so that the steam passage-ways between them subtend an angle to a radial line the opposite to that of the opposing vanes in disks F and G.

At the outer end of journal E of vane-disk G is a bevel cog-wheel P, Fig. 1, and at the outer end of shaft I is a bevel cog-wheel Q, and at R is a larger bevel cog-wheel mounted upon shaft S and engaged with cog-wheels P and G.

In the drawings, Figs. 2, 3, 4, 5, 6, and 7 are shown on a small scale and intended to more clearly illustrate the form of the vane-disks than is shown in Fig. 1, and the number of rows of vanes

896 and the size of the vanes are not the same as is shown in Fig. 1, since in these figures the vanes shown are to illustrate their relative arrangement and manner of action only.

Steam being admitted into the turbine through hollow shaft I and the holes J therein, the first row of vanes T directs it substantially squarely against the second circle of vanes U, and the passage-ways between the vanes in circle U direct the steam against the vanes in circle V, and so on, centrifugally, through the passage-ways of all the outwardly-succeeding circles of vanes, until the steam passes out into the exhaust-case through the peripheral holes H,

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such action of the steam causing the attached disks F and G to revolve in one direction and the inner vane-disk K to revolve in the opposite direction, the cog-wheels P and G transmitting the motion to shaft S in one direction through cog-wheel R.

In Fig. 8 is shown a turbine which is substantially the same as in Fig. 1; but an additional inner vane-disk attached to shaft I is shown at W, and a vane-disk is shown at X, which is attached at its peripheral edge to the outer disks F and G through the medium of the bolts Y and the filling or band Z between the peripheral portions of outer disks F and G, through or under which the bolts pass. It is obvious that a greater number of additional vane-disks may be utilized than is shown in Fig. 8 by lengthening the shaft I between the shoulders of the enlarged portion and by separating the outer disks farther apart and by increasing the width of the case A.

The interspace between the outer vane-disks F and G may be increased to several times the width shown in Fig. 8 in order to utilize a large volume of steam under pressure with a series of disks and vanes of comparatively-small diameter, but adapted to revolve at a very high rate of speed.

I claim as my invention—

1. In a steam-turbine, two revoluble vane-disks peripherally connected, and each mounted apart upon a separate hollow journal so as to form an interspace, a revoluble shaft mounted axially through the journals of the disks, and a vane-disk firmly mounted on the shaft within the interspace, and passage-ways leading into the interspace from a source of steam-supply, a series of circles of vanes, and each vane disposed at the angle substantially as stated, and projecting from the walls of the interspace, and a series of circles of vanes, each disposed at an angle to the first-named vanes and projecting from the sides of the shaft-disk, and adapted to revolve between and in a similar plane to the series of circles of vanes of the walls of the interspace, and in an opposite direction, by virtue of the action of steam, substantially as stated.

2. In a steam-turbine, two revoluble vane-disks peripherally connected, and each mounted apart upon a separate hollow journal so as to form an interspace, a revoluble shaft mounted axially through the journals of the disks, and a vane-disk firmly mounted on the shaft within the interspace, an axial passageway in the shaft in communication with a steam-supply, and passage-ways through the sides of the shaft leading into the interspace, a series of circles of vanes, each disposed at the angle substantially as described, and projecting from the walls of the interspace, and a series of circles of vanes each disposed at an angle to the first-named vanes, and projecting from the sides of the shaft-disk, and adapted to revolve by the action of steam between and in a similar plane to the series of circles of vanes of the walls of the interspace, and in an opposite direction thereto, as stated.

JOHN F. BRADY.

Witnesses:

OSCAR SNELL,
H. L. BROWN.

No. 693,946.

Patented Feb. 25, 1902.

H. H. BOYCE.
TURBINE ENGINE.

(Application filed July 25, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

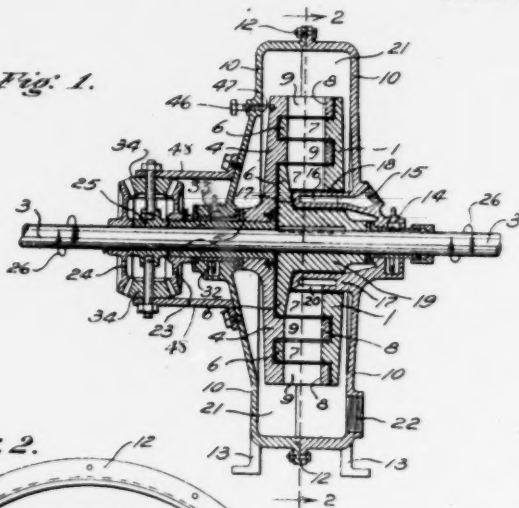


Fig. 2.

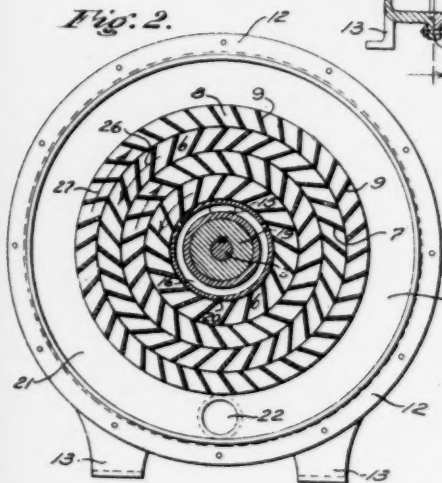


Fig. 3.

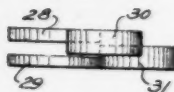


Fig. 4.



WITNESSES:

Geo. F. Edmiston
Glen C. Stephens.

INVENTOR

Hiram H. Boyce
BY
Rumrider & Rumrider
ATTORNEYS.



H. H. BOYCE.
TURBINE ENGINE.

(Application filed July 25, 1901.)

(No Model.)

2 Sheets—Sheet 2.

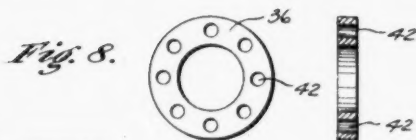
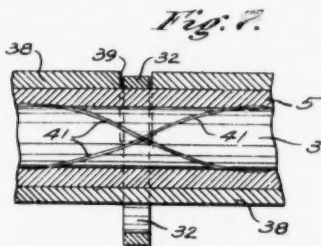
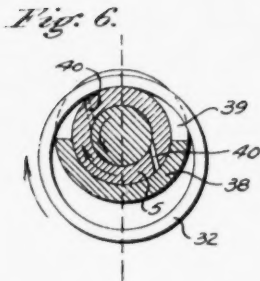
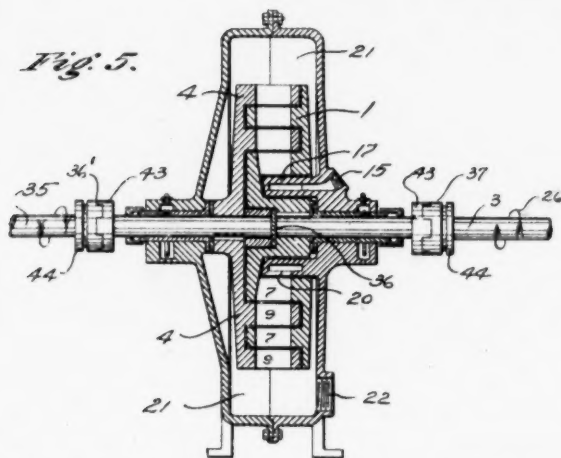


Fig. 9.

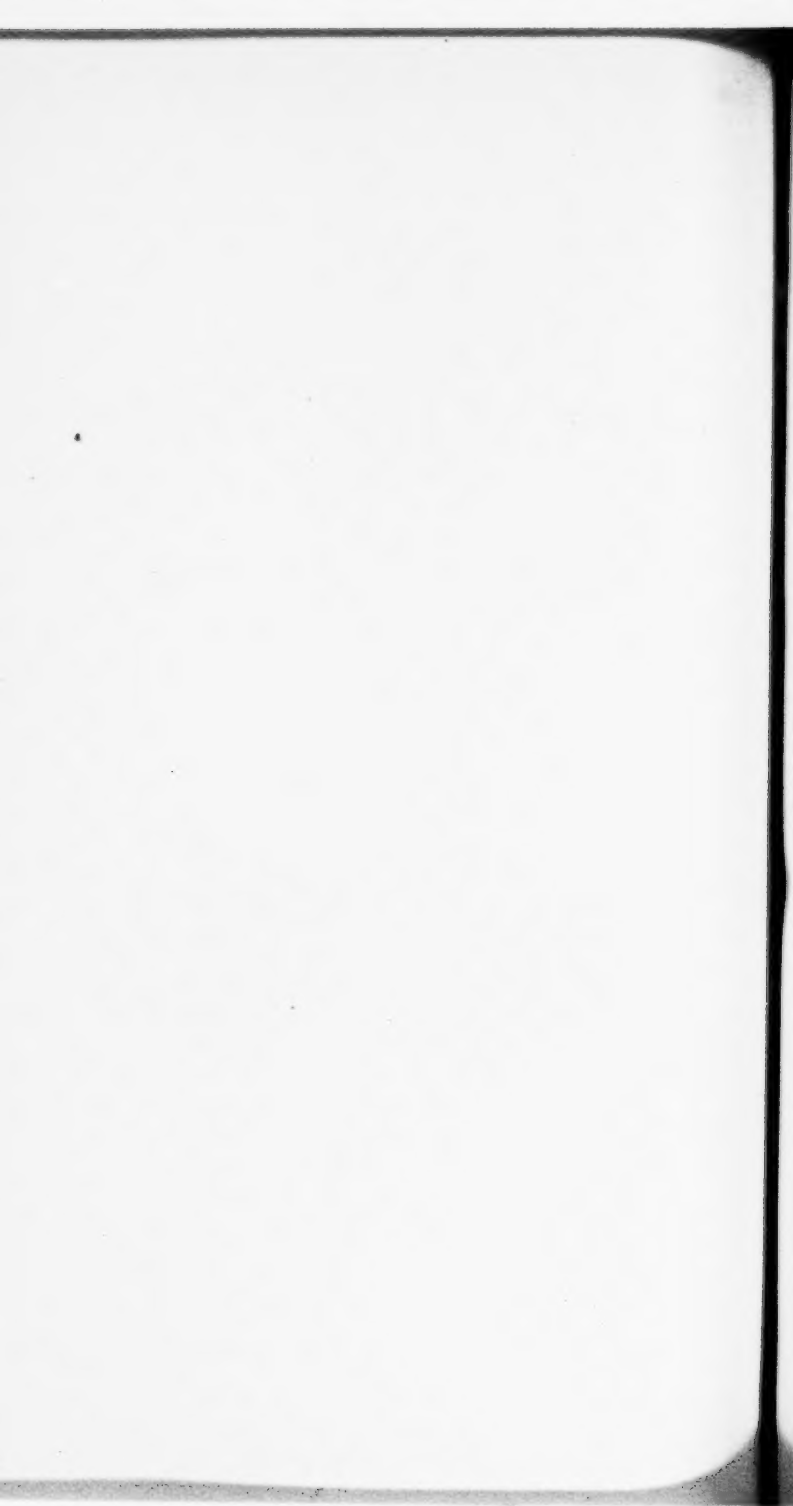


WITNESSES:

Geo. F. Edmiston
Glen C. Stephens

INVENTOR

Hiram H. Boyce
BY
Rummler & Rummler
ATTORNEYS.



901

DEFENDANT'S EXHIBIT 157.

United States Patent Office.

Hiram H. Boyce, of Chicago, Illinois.

Turbine Engine.

*Specification Forming Part of Letters Patent No. 693,946, Dated
February 25, 1902.*

Application Filed July 25, 1901. Serial No. 69666. (No model.)

To all whom it may concern:

Be it known that I, Hiram H. Boyce, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Turbine Engines, of which the following is a specification.

The main object of my invention is to provide a turbine in which the driving-blades are so arranged as to avoid the necessity of having fixed guides, and thereby saving the energy which is lost by friction and impact of the jet of fluid upon such guides.

A further object is to provide improved means for admitting the steam within the wheel and causing same to flow outwardly, thus using the lower pressure at greater leverage.

I accomplish these objects by the device shown in the accompanying drawings, in which—

(Here follow diagrams marked pages 898 and 900.)

Figure 1 is a vertical longitudinal section of a steam-turbine constructed according to my invention. Fig. 2 is a transverse section of the same along the line 2 2 of Fig. 1. Fig. 3 is a diagram in plan, showing a modified system of gearing adapted to serve the same purpose as the bevel-gears shown in Fig. 1. Fig. 4 is a side elevation of the same. Fig. 5 is a vertical longitudinal section of a modification of the device shown in Fig. 1. Fig. 6 is a transverse section through the oil-cup 33; and Fig. 7 is a vertical section of same, partly broken away. Fig. 8 is an elevation of the form of bushing used within the casing, and Fig. 9 is a section of the same.

In the form shown the turbine is constructed as follows: A wheel 1 is axially mounted on a shaft 3 and rigidly secured to said shaft, so as to revolve therewith. A second wheel 4 is axially mounted on a hollow shaft 5, which in turn is loosely journaled on the shaft 3. A series of annular rings 6, each composed of a series of blades or vanes

7, is secured to one face of the wheel 1. A similar series of blade-rings 8 is secured to the adjacent face of the wheel 4. These rings of blades are so arranged that those on one wheel will nearly fill the annular spaces between those on the other wheel. The blades 7 on the wheel 1 are disposed at an angle to the radial direction and oppositely to the blades 9 on the wheel 4, as shown in Fig. 2.

The supporting-frame of the turbine consists of a hollow shell surrounding the wheels and is preferably made in two parts 10 and 11, bolted together at the flanges 12 and resting on the legs 13. A shaft 3 is journaled centrally in the shell, and the bearings are protected by bushings and provided with oil-cups 14 and 33. The bushings within the steam-casing are made with holes passing through them, and these holes are packed with graphite or other lubricant.

Steam is admitted through the port 15, which leads to the annular passage 16 in the ring 17. The ring 17 is integral with the shell 10 and concentric with the shaft 3 and fits a deep annular recess 18 in the hub 19 of the wheel 1. The ports 20 admit the steam from the space 16 to the passages between the blades. The exhaust-steam gathers in the spaces 21, surrounding the wheels, and leaves the machine through the port 22.

The hollow shaft 5 extends beyond the bearing 15 and has rigidly secured at its end the bevel-gear 23. A similar bevel-gear 24 is keyed to the shaft 3. The bevel-pinions 34 are in mesh with both of the gears 23 and 24 and are journaled to the arms 48 on the frame 10. The member 25 spans the shaft 3 and supports the inner ends of the pinion-journals 45. The bolt 46 in the frame and the socket 47 in the wheel 4 serve as a clutch, whereby said wheel may be locked. By locking the wheel 4 and disconnecting the pinions 34 from mesh with the other gears 23 and 24 the machine may be reduced to half capacity.

Another system of gearing for connecting the shafts 3 and 5 is shown in Figs. 3 and 4, the gears being represented by their pitch surfaces. These are spur-gears, and therefore avoid the longitudinal thrust which occurs when bevel-gears are used. The spur-gear 28 is secured to the end of the hollow shaft 5. Another spur-gear 29, of the same diameter as the gear 28, is secured to the shaft 3 at such point that the distance between the adjacent faces of the gears 28 and 29 shall be slightly greater than the width of the rim of such gears. The gears 28 and 29 are connected by the gears 30 and 31, each of which is twice as wide as the gear 28, the gear 30 being in mesh with the gears 28 and 31 and the gear 31 being in mesh with the gear 29. In Fig. 4 the arrows indicate the direction of revolution of the gears having the same respective numbers.

A modified form of my turbine is shown in Fig. 5, in which the wheel 1 is secured to the shaft 3, as before, and the wheel 4 is secured to an independent shaft 35, which is in line with the shaft 3, their ends being separated by a bushing 36. It will be seen that the wheels 1 and 4 are entirely independent and that each of the shafts 3 and 35 may be used to drive entirely independent mechanism. The parts 36' and 37 indicate clutches, in which the parts 43 are secured against rotation, and the parts 44 are splined to the shafts

and revoluble therewith. For simplicity the supports and the operating mechanism of the clutches are omitted in the drawings. It will now be seen that by operating the clutch 37 the shaft 3 may be rigidly locked, and the blades of the wheel 1 will serve as fixed guides. In a similar way the operation of the clutch 36' will secure the wheel 4 against rotation.

The bearings at 33 in Fig. 1 are lubricated by the means indicated in Fig. 6. The bushing 38 has a slot 39 cut in its upper part, and the ring 32 rests in said slot upon the shaft 5, its lower part dipping into the oil in the bottom of the oil-cup. The rotation of the shaft 5 causes the ring 32 to roll, and thereby feeds oil to the surface of the shaft. A number of holes 40 are drilled through the shaft 5 in a slanting direction, as indicated, so that oil between the shaft 5 and bushing 38 is conducted to the adjacent surfaces of the shafts 5 and 3. A number of oil-grooves 41 are cut in the outer surfaces of the shafts 3 and 5, so as to distribute the oil throughout the length of the bearing.

Within the casing a special form of bushing is used, as the moving parts therein are not easily accessible for oiling. This bushing is shown in Figs. 8 and 9, and consists of a body of suitable material through which a number of holes 42 are drilled. These holes are packed with graphite, thus requiring attention only at long intervals.

The operation of my device is as follows: Steam is admitted through the port 15 to the passage 16, from which it is directed by the ports 20 against the first series of blades 7, being deflected by them against the second series of blades 9, and so on to each successive ring until it arrives at the spaces 21, from which it is exhausted through the port 22. It will be seen from Fig. 2 that the wheel 1 will be driven in the direction of the arrow 26 and the wheel 4 will be driven in the direction of the arrow 27. It will be also seen that the steam in leaving one series of blades is immediately directed against the second series and that in this manner each series of blades serves as guides for the next series. In this way the loss of energy due to friction and impact of the steam upon the guides, as in the old form of turbine with fixed guides, is avoided. As the steam expands and gradually loses its energy in its passage outwardly, this is the most efficient direction of flow, since the leverage increases as the pressure of the driving fluid decreases. The ports 20 occur at equal intervals on the circumference of the ring 17, leaving a considerable part of such circumference without openings, so that the steam will be cut off from the passages in the first blade-ring for a fraction of the revolution. In this way a high ratio of expansion of the steam is secured without use of an excessive number of blade-rings and the consequent increase of friction. In case the engine is used to drive independent machines, the form of engine shown in Fig. 5 could be used.

It will be seen that numerous details of the device may be altered without departing from the spirit of my invention. I therefore do not confine myself to such details, except as hereinafter limited in the claims.

maintain a uniform speed ratio between them. The present invention combines the gearing for this purpose with that required for speed diminution and for revolving the propellers in opposite directions at equal speeds. In my Patent No. 748,759, of January 5, 1904, and in said Davison patent, the turbine is mounted upon an axis co-incident with the major axis or center line of the torpedo. The present invention locates the oppositely revolving turbines in a plane perpendicular thereto so that they turn around an axis transverse to the torpedo.

(Here follows diagram marked pages 904 & 906.)

In the accompanying drawings Figure 1 is a longitudinal section of the after-portion of the torpedo hull showing the propelling mechanism in elevation. Fig. 2 is a vertical mid-section of the turbine engine and gearing on a larger scale. Fig. 3 is a view partly in elevation and partly in section cut on the plane of the line 3-3 in Fig. 2. Fig. 4 is a diagrammatic view showing the gearing in simplified form.

In the drawings A is the torpedo hull, B B' are the propellers, C C' the propeller shafts and D D' the turbines. The inner shaft C carries the after-propeller B, while the outer or tubular shaft C' carries the forward propeller B'. The turbine D is mounted on an inner shaft E, while the turbine D' is mounted on a tubular shaft E' surrounding the shaft E. These turbines revolve in opposite directions at preferably like speeds. The shafts E E' carry respectively pinions F F', preferably of equal size, and these mesh with relatively large gear wheels G and G' which carry bevel pinions H H' respectively. These pinions mesh with larger bevel gears J and J' which are mounted respectively on the shafts C and C'. The gears J and J' mesh with both pinions and thus constitute a nest of gearing which serves on the one hand for connecting the turbine wheels D D' so that these are compelled to revolve in contrary directions at a predetermined speed ratio; and on the other hand to connect the shafts C C' so that the propellers are compelled to turn in contrary directions at a determined speed ratio. The system of gearing also, by reason of the step down which occurs between the pinions F F' and the gears G G', and the second step down which occurs between the pinions H H' and gears J J', accomplishes the desired reduction of speed between the turbines and propellers. The entire group of gearing is arranged adjacent to the turbine instead of the reversing gears being located, as heretofore, in the tail section; thus the same gearing serves the triple purpose of reduction gearing, of connecting the turbine wheels that revolve at equal speeds, and of reversing the direction

F. M. LEAVITT.
DRIVING MECHANISM FOR TORPEDOES.
APPLICATION FILED APR. 8, 1912.

1,088,080.

Patented Feb. 24, 1914.

2 SHEETS—SHEET 1.

Fig. 1

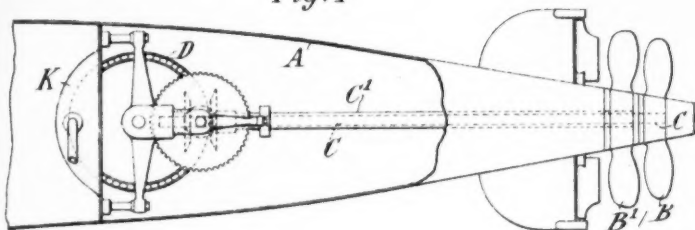
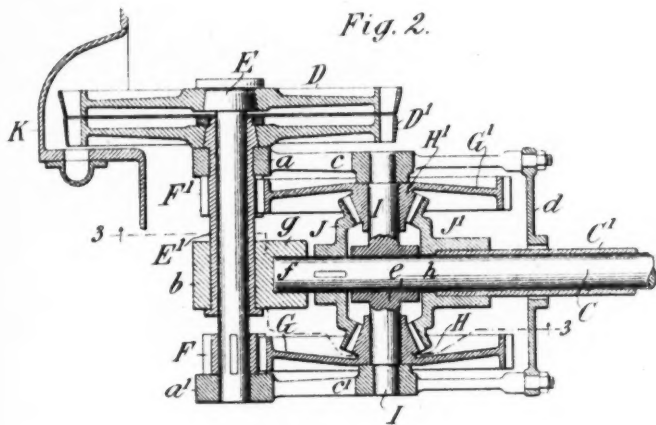


Fig. 2.



WITNESSES:

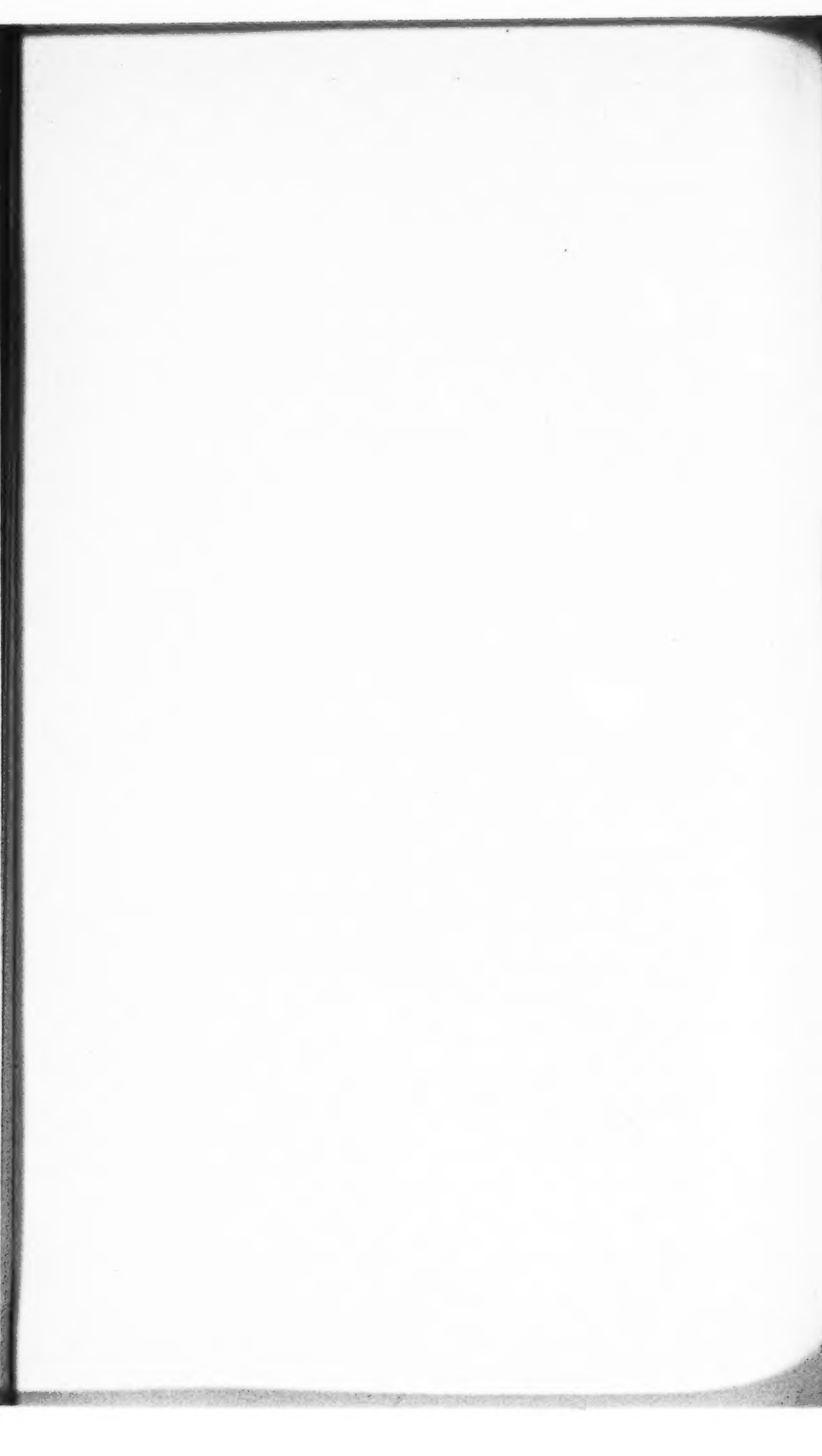
Rene' Guine
Fred White

INVENTOR :

Frank M. Leavitt,

By Attorneys,

Orneser, Turk & Myers



P. M. LEAVITT.
DRIVING MECHANISM FOR TORPEDOES.
APPLICATION FILED APR. 8, 1912.

1,088,080.

Patented Feb. 24, 1914.

2 SHEETS—SHEET 2.

Fig. 3.

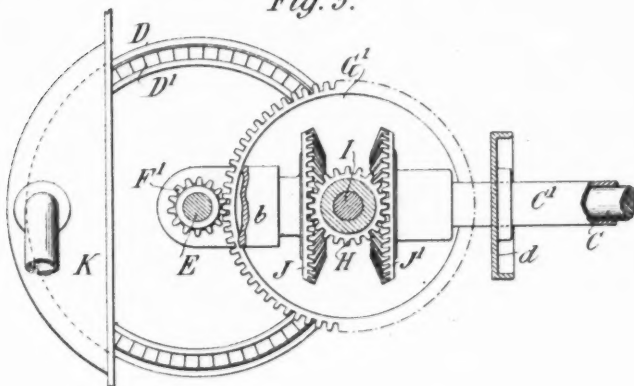
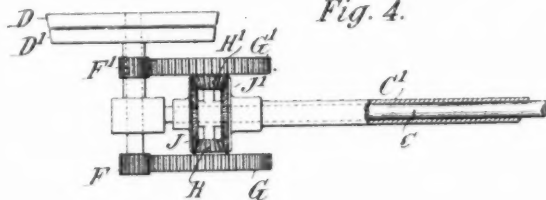


Fig. 4.



WITNESSES:

Rene' Gruene
Fred White

INVENTOR :

Frank M. Leavitt,

By Attorneys.

Orason. Junt & Myers



of rotation of the respective propellers and maintaining their rotation at uniform speed ratios.

The several shafts and gears may be variously mounted. In the construction shown the shafts $E E'$ are carried in bearing $a a'$, b , the bearing $a a'$ being formed in frames $c c'$ which are connected at their opposite ends by a yoke d , between which frames is mounted a cross-piece I , the opposite end portions of which serve as studs around which the gears $G G'$ turn while its middle portion is formed as a hub encircling the shaft C and which may form a bearing e for this shaft. This shaft is also shown as having a thrust bearing f in a cross-frame g , which also forms a bearing b . The outer shaft C' may have its thrust bearing at h against the hub e . The frames $c c'$ thus support the entire group of gearing between them, and these frames are extended laterally and terminate in feet which are adapted for attachment to some suitable part of the torpedo. The preferred attachment is that shown in Fig. 1, where the feet are formed as perforated bosses engaging the ends of studs fixed to the transverse bulkhead K . The frames $c c'$ are preferably of identical construction, being mates. The described construction enables the entire propulsion system to be assembled as a unit exterior to the torpedo and then inserted bodily therein.

The details of construction may be greatly varied without departing from the essential features of the invention.

The turbine wheels $D D'$ require, of course, to have their buckets oppositely pitched in order that the fluid received by the initial wheel D' from the nozzle i may be reversed in direction and delivered thence into the opposite buckets of the secondary wheel D , this being well understood in turbine construction. The nozzle i is shown as formed in a cross-partition or bulkhead K which divides the turbine hull.

Any suitable kind of bearings may be used and any suitable means may be provided for supplying lubricant for these bearings. If in any case the avoidance of gyroscopic effect of the turbine is not deemed important either turbine wheel D or D' might be omitted; for example, the secondary wheel D might be omitted with its shaft E , pinion F and gear G , the other parts being retained as shown; in such case the pinion H would serve solely as an idler and might be omitted.

What I claim is:

1. In a torpedo, the combination of a turbine engine mounted on a transverse axis, a pinion driven thereby, a gear wheel meshing with said pinion, a bevel pinion driven at reduced speed therefrom, opposite bevel gears driven in contrary directions by said pinion, outer and inner propeller shafts carrying the respective gears, and propellers carried by said shafts respectively.

2. In a torpedo, the combination of a turbine engine, comprising oppositely rotating turbine wheels, pinions connected thereto respectively, gear wheels meshing with said pinions, bevel pinions carried by said respective gear wheels, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective gears, and propellers carried on said shafts respectively.

3. In a torpedo, the combination of a turbine engine mounted on a transverse axis and comprising oppositely rotating turbine wheels, outer and inner shafts therefor, pinions on said shafts respectively, gear wheels meshing with said pinions, bevel pinions carried by said respective gear wheels, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective gears, and propellers carried on said shafts respectively.

4. In a torpedo, the combination of a turbine engine on a transverse axis, a shaft therefor, a pinion on said shaft, a gear wheel and bevel pinion driven therefrom, a transverse fixed stud on which said gear and bevel pinion turn, opposite bevel gears driven in contrary directions from said bevel pinion, outer and inner propeller shafts carrying said respective bevel gears, and propellers carried on said shafts respectively.

5. In a torpedo, the combination of a turbine engine comprising oppositely rotating turbine wheels on a transverse axis, outer and inner shafts therefor, pinions on said shafts, gear wheels on a transverse axis meshing with said pinions and having bevel pinions, said gear wheels and bevel pinions turning on a fixed transverse stud, opposite bevel gears driven in contrary directions from said pinions, outer and inner propeller shafts carrying the respective bevel gears, and propellers carried on said shafts respectively.

6. A propulsion unit for an automobile torpedo comprising a turbine engine on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said engine and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts adapted to be inserted in or removed from the torpedo as a whole.

909 & 910 7. A propulsion unit for an automobile torpedo comprising a turbine engine having oppositely rotated turbine wheels on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said turbine wheels and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts adapted to be inserted in or removed from the torpedo as a whole.

8. A propulsion unit for an automobile torpedo comprising a turbine engine on a transverse axis, inner and outer propeller shafts, reducing and reversing gearing between said engine and shafts whereby the latter are driven at reduced speeds in contrary directions, and a bearing frame for said gearing, engine, and shafts comprising frames carrying said gearing between them and having feet adapted to be fastened into the torpedo

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

H. F. HUGHES.

F. L. COLWELL, JR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

911 United States Circuit Court of Appeals for the Second Circuit, October Term, 1914.

No. 132.

Argued May 11, 1915. Decided June 8, 1915.

THE UNITED STATES, Complainant-Appellant,
vs.
THE E. W. BLISS COMPANY, Defendant-Appellant.

Appeals from the District Court of the United States for the Eastern District of New York.

Before Coxe, Ward and Rogers, Circuit Judges.

On cross appeals from a decree of the District Court for the Eastern District of New York. The defendant seeks to reverse that portion of the decree which restrains it from making use of the "balanced turbine" in any torpedo constructed for any corporation, individual or government other than the complainant, and from exhibiting or communicating to any such corporation, individual or government any torpedo which shall contain the said balanced turbine.

The complainant seeks to reverse that part of the decree which dismisses the bill and refuses an injunction as to other parts 912 of the torpedo which the complainant contends were designed by its officers, agents and servants such, for instance, as ball bearings for the gyroscope.

The complainant also seeks to reverse the decree for the reason that the court should have decided that the disclosure of any of the alleged novel constructions was a violation of the laws of the United States known as the National Defense Act of March 3, 1911.

ARTHUR C. FRASER,
ALBERT B. BOARDMAN,
FRANK H. PLATT, AND
ROBERT H. ELWELL,

For the Defendant-Appellant.

ARCHIBALD R. WATSON,
JOHN H. HARRINGTON, AND
MELVILLE J. FRANCE,

For Complainant-Appellant.

COXE, J.:

Clause 19 of the contract of November 22nd, 1905, which became Clause 20 in the contract of June 12, 1912, is the clause out of which the controversy between the parties principally arises. The contract provides that the Bliss Company will make and deliver at Newport, Rhode Island, 300 torpedoes of the Bliss-Leavitt 5 meter 12-inch

mark 1 type. The manufacture of these torpedoes is to conform to plans and specifications annexed to the contract and the work is to be done and the materials are to be furnished under the supervision of inspectors appointed by the Secretary of the Navy. When completed, the torpedoes are to be tested and need not be accepted by the Government unless they comply with all the requirements of the specification. Clause 19 also provides that the Bliss Company will not make use of any device the design for which is furnished by the United States, represented by the Bureau of Ordnance, in any torpedo constructed for persons or governments, other than the United States. This clause further provides that the Bliss Com-

pany will not exhibit, describe or give information in regard
913 to such devices to any firms, corporations or governments other than the United States. The Bliss Company agrees that it will not exhibit any torpedo containing such device to any governments, or to their representatives, other than the United States. In case of the breach of these provisions by the Bliss Company the United States shall be at liberty to cancel the contract and proceed with the manufacture of torpedoes contracted for in the agreement, including all improvements, without the payment of royalty, license fee or other charge on account of the use therein of any models, designs, devices, appliances or other features invented and communicated to the Bliss Company by the United States or its agents. The clause further provides that in the case of a breach by the Bliss Company, all torpedoes with the designs, drawings, patterns, models and prepared material therefor, on account of which payment in any amount shall have been made, shall become the property of the United States. Clause 19 concludes as follows.

"Provided furthermore, that no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

In 1912 another contract was made between the parties for the manufacture of one hundred and twenty additional torpedoes of the same type, in which it is stated that the torpedoes are to conform in all respects to the drawings referred to which are not annexed to the contract for the reason that:

"They contain information of a confidential character that
914 cannot be made public without detriment to the government's and the contractor's interests, and they are to be treated as confidential by the parties to this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract."

The bill alleges that the feature of the balanced turbine was invented by the officers composing the Bureau of Ordnance in 1906-7

and due notice thereof under clause nineteen was given to the defendant. That in like manner the complainant gave notice, through its agents, of changes in the vertical rudder, the method of starting the torpedo, in the engines, the fire gyro, the independent spin, the ball bearings of gyro and compound regulation of the air.

This case illustrates the importance of a great government like the United States having a manufactory of its own for the manufacture of torpedoes and other implements of war which are improved and changed from time to time by the addition of ingenious mechanism which should clearly be kept secret unless our enemies are to profit equally with ourselves in every improvement which the ingenuity of our army and navy officers may suggest. The futility of attempting by agreement to give to an outside contractor the benefit of such improvements as he may suggest while keeping secret other improvements in the same machine devised by officers of the navy and their assistants, is demonstrated by the testimony in the case at bar. How is it possible for the Bliss Company to make public their own improvements and suggestions, in the construction of a given type of torpedo, and at the same time keep secret the suggestions and improvements made by the officers of the navy and their assistants? The defendant insists that all of the improvements in controversy were suggested and embodied in working models by it or its employees. Mr. Leavitt, defendant's chief
915 engineer, testifies that the defendant got no assistance whatever from the Government officials and that though they made many suggestions, not a single one was adopted by the Bliss Company. On the other hand, the Government insists that all of the improvements now in controversy were the result of the experiments made by the Bureau of Ordnance of the United States Navy.

Stated concretely the question now to be considered is whether or not the Bliss Company has a right to exhibit and sell to the representatives of foreign nations the so-called Bliss-Leavitt torpedo. We think it is clear that it cannot do so. The language of the nineteenth clause is explicit and its purpose is obvious, viz., to keep secret the construction of any torpedo which contains a device the design for which is furnished by the United States or its agents and to bind the defendant not to disclose the performance of any torpedo containing such device to any one other than the United States. The contract should be construed in view of what must have been the intention of the United States. She was not engaged in procuring a perfected torpedo for the benefit of foreign nations. Her officers and experts were endeavoring to secure some device which was better than those possessed by foreign nations. That she should wish her experiments kept secret is too obvious for argument. Indeed, it might almost be inferred without specific provisions. The contention of the defendant is very clearly stated in the letter of May 9, 1913, in which it says:

"We have repeatedly insisted that said article of the contract (Twenty) did not apply for the protection of any principle, but merely to 'any device the design for which was furnished for us by

the Government'; that the specific design furnished has been and will be kept a secret; that the 'principle' having been made public by the grant by the Government of a patent for it, which patent the Government afterwards purchased, the 'principle' of the
916 balanced turbine is no longer a confidential matter and we cannot be held to a secrecy which the Government has itself waived."

We think this takes too narrow and superficial a view of the matter and if followed will leave the Government practically remediless unless she makes her munitions of war in her own factories. It is true that the contents of the Davison patent were made public when the patent was issued, but the Government purchased it and no one can use its disclosures without infringing unless he has obtained a license so to do. "A principle" is not the subject of a patent except through the instrumentalities by which the principle is carried out. No one can secure a patent for the principle of striking the enemy's ship under water with a loaded torpedo. As the means disclosed by Davison's patent belong to the complainant, it is not easy to see what rights the defendant acquired by the granting of the Davison patent. If it owned the patent or if it were licensed under it, a different question would arise, but being, in a sense, the confidential agent of the Government in the making of torpedoes, it acquired no rights adverse to those of the Government. We fail to see how the defendant has acquired a right to do what it promised it would not do because a patent has been issued which makes public some of the methods and devices used in the manufacture of the Bliss-Leavitt torpedo. In this connection it is interesting to note that the defendant agreed with this view in December, 1912, when it wrote to the Bureau that the publication of the patents in no way prevented the real construction of the fundamental parts of the torpedo from being kept secret.

There can be no doubt, we think, that the balanced turbine was the invention of Lieutenant Commander Davison, acting for the United States, and that the Government did not lose the benefits of the invention because the patent subsequently issued in his name, and assigned to the Government, "disclosed" the invention to the world. Certainly the fact that foreign patents were issued
917 which were subsequently purchased by the defendant did not give the defendant the right to make, use or sell the patented structure in this country without the license of the owner of the patent.

The contract of June 12, 1912, provides that the drawings, plans and specifications used by the defendant in making the Government torpedoes should not be disclosed to anyone. Although the Bliss Company might sell torpedoes to other nations and individuals it could not sell such torpedoes if they contained a device designed by the Government, acting through its officers and experts.

Throughout the entire record, in the contracts, correspondence and dealings of the parties, the importance of secrecy is everywhere manifest. The nature of the services rendered was such that secrecy might almost be implied. It is difficult to imagine a nation giving

to one of its citizens contracts to manufacture implements necessary to the national defense and permitting that citizen to disclose the construction of such implement or sell it to another nation. The very nature of the service makes the construction urged by the defendant untenable. We are of the opinion, therefore, that the injunction should include all designs, drawings, plans and specifications used by the defendant in making the Bliss-Leavitt torpedo for the Government which were approved by the Ordnance Bureau, notice of which was given to the Bliss Company pursuant to the provisions of Clauses 19 and 20 of the contracts in question.

The decree should be amended by adding such a provision and, as so amended, it should be affirmed with costs.

918 At a Stated Term of the United States Circuit Court of Appeals, in and for the Second Circuit, held at the Court Rooms in the Post Office Building in the City of New York, on the 18th day of June, one thousand nine hundred and fifteen.

Present:

Hon. Alfred C. Coxe,
Hon. Henry G. Ward,
Hon. Henry Wade Rogers,
Circuit Judges.

THE UNITED STATES, Complainant-Appellant,

vs.

THE E. W. BLISS COMPANY, Defendant-Appellant.

Appeals from the District Court of the United States for the Eastern District of New York.

This cause came on to be heard on the transcript of record from the District Court of the United States, for the Eastern District of New York, and was argued by counsel.

On Consideration Whereof, it is now hereby ordered, adjudged and decreed that the decree of said District Court be and it hereby is amended in accordance with the opinion of this court and as so amended, affirmed. It is further ordered that the Judge of the District Court be and he is hereby instructed to amend the decree in accordance with the opinion of this court.

A. C. C.

H. G. W.

It is further ordered that a Mandate issue to the said District Court in accordance with this decree.

919 Endorsed: United States Circuit Court of Appeals, Second Circuit. United States vs. E. W. Bliss Co. Order for Mandate. United States Circuit Court of Appeals, Second Circuit. Filed July 2, 1915. William Parkin, Clerk.

920 United States Circuit Court of Appeals, Second Circuit.

In Equity.

THE UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

Petition of Defendant for Reargument.

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Arthur C. Fraser, Solicitor for Defendant, 170 Broadway, New York.

Arthur C. Fraser, Frank H. Platt, Robert H. Ewell, of Counsel for Petitioner.

New York: Stillman Appellate Printing Co., 1915.

United States Circuit Court of Appeals, Second Circuit. Filed Oct. 2, 1916. William Parkin, Clerk.

921 United States Circuit Court of Appeals, Second Circuit.

In Equity.

THE UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

Petition for Reargument.

To the Honorable the Judges of the United States Circuit Court of Appeals for the Second Judicial Circuit:

The petition of the E. W. Bliss Company, defendant herein, respectfully shows:

Your petitioner requests a reargument as to each of the four devices included in the decree (See Exhibit F hereto annexed), namely:

I. Balanced Turbine.

Because the use of balanced or counter-rotating turbines and the application of such balanced turbines to torpedoes had been patented and publicly known and become public property prior to any communication thereof by the complainant to the defendant; and such use of balanced turbines in torpedoes had been originated and used

922 by defendant prior to such time, and was in defendant's possession, and hence the complainant could have furnished to defendant nothing more than the specific design delivered to defendant in January, 1907, at which time the defendant already had constructed and operated its own specific design and was proceeding to manufacture balanced turbines of such design for use in the torpedoes in course of manufacture under the then pending contract; and as to such specific design of January, 1907, all contract obligations pertaining thereto were terminated by the complainant's act in publishing said design to the world by the grant and issue on June 26, 1907, of Letters Patent of Davison, No. 858,256, owned by the complainant. The defendant by its ownership and acquisition of corresponding foreign patents for the same device acquired and had and has the right to operate in foreign countries under such foreign patents. The balanced turbine in the existing type of Bliss-Leavitt torpedo is radically different from such specific device and contains nothing in common therewith except the broad principle of balancing turbines by counter-rotation, which principle was fully disclosed by said Letters Patent. The specific design of balanced turbine in the existing type of torpedo is solely of defendant's production and is defendant's property and is outside the obligations of paragraph 19th of the 1905 contract, or paragraph 20th of the 1912 contract between the parties. The latter contract specifically authorized the sale by the defendant of such existing type of torpedo in foreign countries. To enjoin defendant against such sale of torpedoes containing balanced turbines in effect deprives the defendant of its right under the contract.

II. Ball Bearings for Gyroscope.

Because the Naval design of ball bearings is not used in the existing type of torpedo; the defendant had always recognized the Government's right in this design and has never threatened 923 or intended to make or use it in violation of the contract obligation, and as to this device, therefore, no cause of action has ever arisen.

III. Improvement in Inside Super-Heater.

Because the Naval design for an improvement in the inside super-heater is a device long since obsolete; it never has been used in the existing type of torpedo and is a device as to which the defendant has always recognized the complainant's property rights, and has never threatened or intended to violate the contract obligations concerning such device, and hence as to this device no cause of action has ever arisen.

IV. Compound Regulation of Air.

Because the use of two reducing valves in torpedoes was public property, the subject-matter of expired United States patents, and

was known to be in use in torpedoes of foreign manufacture; and complainant furnished to the defendant no design of any such device as contemplated by the contracts and gave the defendant nothing more than an oral suggestion of a plan or idea of double regulation or pressure reduction. The injunction as to this device in effect forces upon the defendant the contract obligation as to ideas, methods or suggestions which the defendant had specifically refused to enter into.

With respect to this compound regulation of air, the Court's special attention is directed to the record and the following statement:

Your petitioner is making, simultaneously with this petition, a motion in this Court that the decree herein be reformed by striking from it the clause as to the double air regulator. If the motion to strike this clause from the decree is granted, then this petition for a rehearing should be denied so far as the double air
924 regulator is concerned. But if the motion to strike out the double air regulator is denied, then we earnestly request a rehearing on the law and facts as to this device.

To permit this injunction to stand means:

First, that the findings of fact of the Trial Court are reversed by the Appellate Court which, as has been held again and again, should not be done unless such findings are clearly wrong, and, with all respect, we submit that there is no evidence sustaining, or even tending to sustain, a finding of fact by this Court that a design for a double air regulator was ever furnished, and

Second, that the proposed contract submitted by the Bureau of Ordnance in October, 1905, extending to the Government protection as to suggestions, ideas, etc., which the Bliss Company then rejected, is now being forced upon the Bliss Company by judicial construction.

As the record now stands, the double air regulator has been included within the injunction without any reason being given for its inclusion. This leaves the parties wholly in the dark as to their rights and obligations. The Government is apparently held to be entitled to protection as to every suggestion which it may make without furnishing any design, which is precisely what it aimed at when it submitted its draft of the secrecy clause in October, 1905. But the Bliss Company rejected the draft. It refused to grant protection as to ideas and suggestions, and was willing to grant protection as to concrete embodiments only. Hence, the contract as actually signed limited the protection to designs of devices furnished by the Government. The Trial Court found as a fact that no design for a double air regulator was furnished (See Exhibit A hereto annexed). Then this Court handed down a unanimous opinion
925 (See Exhibit C hereto annexed) in which the double air regulator was not discussed, and in which there is no intimation of any intent to alter, modify or enlarge the findings of fact of the Trial Court. Judge Veeder did not understand that this Court intended to make any new findings of fact, but, to make certain, he conferred informally with Judge Coxe, who wrote

in reply: "I have at last heard from all the members of the Court in the Torpedo Case, with the result that the majority is of the opinion that the devices for the compound regulation of air should be within the injunction" (See Exhibit E hereto annexed). Judge Veeder construed this as an absolute mandate to include the double air regulator within the injunction (See Exhibit E hereto annexed). Judge Veeder accordingly signed a decree enjoining the use "of the device for the double regulation of air, the design for which was furnished to the defendant by oral description" (See Exhibit F, hereto annexed), although as Judge Veeder knows there is no evidence in the record that any "oral description" of a design for such double regulation ever was furnished.

The members of this Court were away on vacation when the correspondence with Judge Veeder took place (See Exhibit E) and we doubt whether this Court then read the evidence with a view of ascertaining whether Judge Veeder's findings of fact were right or wrong. We imagine that Judge Coxe was merely giving an informal expression of opinion, and, in that belief, we have made the motion to strike the double air regulator from the injunction. If, however, we are wrong and it was the intention of this Court to make a new finding of fact different from that of the Trial Court, we respectfully request a new hearing as all of the defendant's counsel have searched the record in vain for any evidence tending to sustain such a finding.

926 For convenience we have annexed hereto copies of the following papers: Exhibit A, Decision of Judge Veeder, filed April 14, 1914 (the secrecy clause is quoted in full in this decision); Exhibit B, Decree of May 5, 1914; Exhibit C, Formal Opinion of this Court; Exhibit D, Mandate, filed July 3, 1915; Exhibit E, Memorandum of Judge Veeder, filed August 25, 1915 (containing correspondence between Judge Coxe and Judge Veeder); Exhibit F, Decree of August 25, 1915.

Wherefore your petitioner respectfully prays the Court to grant a reargument of this case.

E. W. BLISS COMPANY,
Defendant,

By Its Solicitor, ARTHUR C. FRASER.
E.

New York, October 2, 1915.

We hereby certify that the foregoing petition for a rehearing is, in our opinion, well founded in point of law and is not interposed for purposes of delay.

ARTHUR C. FRASER,
E.
FRANK H. PLATT,
E.

Of Counsel.

927

EXHIBIT A.

Decision of Judge Veeder.

Filed April 14, 1914.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

William J. Youngs, United States Attorney.

Malcolm A. Coles, Special Assistant to Attorney General, and
Louis R. Bick, Assistant U. S. Attorney, for Complainant.

Arthur C. Fraser, Frank H. Platt and Robert H. Ewell, for defendant.

In this suit the complainant seeks to enjoin the defendant from communicating the complete construction and operation of the existing type of Bliss-Leavitt torpedo, so-called, and from making any demonstration thereof, to a representative of Messrs. Whitehead & Company, or to any other person or government. The complainant bases its claim to relief partly upon contract provisions, and, in the alternative, upon the provisions of the Act of Congress of March 3, 1911 (36 Stat. 1084, 1085), commonly called the National Defense Act.

It appears that the defendant has been making torpedoes for the use of the United States Navy since November 22, 1905. Pursuant to the terms of various contracts between the parties, several lots of torpedoes have been delivered to the complainant, but there remain undelivered some of the torpedoes called for by a contract of June 12, 1912, as well as all those specified in contracts subsequent thereto. The only contracts in evidence are those of November 22, 1905, and June 12, 1912, mentioned in the complaint, and one of the intervening contracts, dated June 16, 1909. In the 1905 contract there was the following provision, which it is admitted was embodied in all the subsequent contracts:

"Nineteenth. It is hereby expressly further stipulated, covenanted and agreed, that the party of the first part will not make use of any device the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations or others, or for other governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to, or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the party of the first part will not exhibit the performance of any torpedo containing such device either in shop or in service tests, to any person or persons, firms, corporations or others, or to other governments, or their representatives, than the party of the

second part hereto; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract.

"Provided furthermore, that no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when the said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

In the contract of June 12, 1912, the foregoing clause became clause Twentieth. The 1912 contract contained, however, in the second clause, the following new matter, which (save that part enclosed by brackets) had not been included in previous contracts:

"[Second. The manufacture of said torpedoes] (the word 'torpedoes' as used throughout this contract being intended to include everything covered by the drawings, plans and specifications above referred to) [shall conform in all respects to and with said drawings, plans and specifications] including duly authorized changes therein, but said drawings, plans and specifications are not hereto annexed or made a part hereof. They contain information of a confidential character that cannot be made public without detriment to the government's and the contractor's interests, and they are to be treated as confidential by the parties of this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract."

Eventually, the defendant, desiring to negotiate with Messrs. Whitehead & Company for the sake of the right to manufacture the Bliss-Leavitt torpedo in certain foreign countries, and being met by the opposition of the Bureau of Ordnance, communicated to the

Secretary of the Navy, on May 9, 1913, its desire to submit the issue to judicial decision, adding:

"As a means to this end we notify you hereby that it is our intention to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and to make a demonstration of the operation of said torpedo, to a representative of Messrs. Whitehead & Company on or immediately after June 1, 1913."

Thereupon this suit was brought. Although the issue arose over the use of the so-called balanced turbine, the bill of complaint sets forth four devices the design for which is claimed to have been furnished by the complainant to the defendant in accordance with the restrictive terms (as quoted above) of the contracts: (1) the balanced turbine, (2) ball bearings in the gyroscope, (3) superheater, and (4) compound air regulator. In addition to the foregoing devices, the complainant specifies four other principles, designs and devices, which, although not furnished by the complainant to the defendant in accordance with the terms of the 19th and 20th clauses of the contract, are nevertheless claimed to have been communicated or suggested to the defendant by the complainant, and the disclosure of which, together with those already mentioned, is prohibited, it is contended, by the National Defense Act of March 3, 1911 (36 Stat. 1084, 1085): (a) changes in location and area of vertical rudders; (b) changes in method of starting torpedoes; (c) changes in type of depth engine, and (d) changes in curved fire gyro. All the foregoing devices and designs are alleged to be contained in the existing type of Bliss-Leavitt torpedo.

I construe the agreement between the parties to mean that the Bliss Company was free from the beginning to make and sell torpedoes to any other party or government, save as limited by the restrictive clause relating to devices the design for which had been furnished by the Government; that is to say, the additional clause in the 1912 contract made explicit that which was implicit in the contract of 1905 and intervening contracts.

The Bliss Company agrees that "it will not make use of any device, the design for which is furnished to it by the party of the second part in any torpedo constructed or to be constructed for any person or persons, firms, corporations or others, or for other governments." The defendant contends that the word "furnished"

must be construed to mean the furnishing of devices which were unknown not only to the defendant but in the prior art as well; in other words, such devices only as were patentable at the time the design was furnished. I am unable to assent to such a construction. It is warranted neither by the plain wording of the contract nor by the surrounding circumstances. The evidence shows that the Navy Department was carrying on extensive independent experiments with torpedoes, utilizing the skill and experience of its own officers. The defendant was occupied in developing its torpedo in conformity with the wishes of its sole customer. Inasmuch, however, as the defendant was not prohibited from making torpedoes for others, some provision was necessary to protect the Government in its con-

tributions to the joint result. The contract provision indicates, as the evidence shows, that this method was deliberately adopted by the Government as the most secure and efficient method of protecting its interest. There would be no security for that interest if the defendant, incorporating devices furnished by the Government, could afterwards sell those devices to other persons or governments unless the Navy Department could establish patentable invention in each instance. It seems plain to me that in the consideration of any contribution made by the Government, the prior art, as well as the defendant's actual knowledge, with respect thereto is as irrelevant as the question whether any such device was or is more or less efficient than another device which was available and might have been used. "Furnish," as used in the context, means simply supplying a device not then in use in the torpedo. It is urged that this conclusion will bear heavily upon the defendant,

933 commercial use of devices available to others as part of the prior art. But if the consequences of its formal agreement were at all relevant to the issue, it would be reasonable to suppose that they were carefully considered in the formation of its very valuable business relations with the Government. And, in any event, it would be obviously inequitable to permit it to use, for a period of years, in making torpedoes for the Government, a device furnished by the Government, and then when it seeks to sell the developed torpedo to other persons or governments to raise for the first time an issue of prior knowledge or prior art.

It appears from the evidence that three of the devices relied upon by the Government were furnished under the 1905 contract and the fourth under the 1912 contract, and the claim is made by the defendant that since the 1912 contract superseded the previous contracts an injunction can issue only against violations of that contract. A subsequent contract covering the same subject matter as a prior contract doubtless supersedes the earlier contract. Here, however, each successive contract, while relating to torpedoes, covered different subject matters. In this case it appears that the restrictive provision concerning devices furnished by the Government was incorporated in substantially the same terms in each successive contract, and I have no doubt that when once the design is furnished and notice given under any contract, the restrictive covenant applies under subsequent contracts so long as the device continues to be used in torpedoes made under those contracts.

The Bliss Company has notified the Government that it proposes to communicate the complete construction and operation of
934 the existing type of Bliss-Leavitt torpedo to a prospective purchaser. The expression "existing type" would ordinarily mean every type in existence or use, but inasmuch as the Bliss Company expressly refers, at the outset of its notice, to the 1912 contract, and the evidence is not clear whether any other type is at present in existence or use, the type of torpedo called for by that contract may be accepted as the type involved in this suit.

Accordingly, in the absence of any contention by the defendant

that the penalty prescribed in the contract is exclusive, I have only to find which, if any, of the four devices relied upon by the Government were furnished by it in accordance with the terms of the contract, and which, if any, of the devices thus furnished are embodied in the existing type of torpedo.

I find that designs for the following devices were furnished to the defendant by the Government, and that at the time such devices or designs were conveyed to the defendant by written communication from the Government, the Government stated to the defendant in writing in each instance that the device or design was embraced within the provisions of the restrictive clause of the contract: (1) the balanced turbine, as specified in Exhibits 28 and 29, dated Jan. 10, 1907; (2) ball bearings in the gyroscope, as specified in Exhibits 52 and 53, dated March 31, 1906; (3) improvement in inside superheater, as specified in Exhibits 54 to 57 inclusive, dated Sept. 18, 1906.

Of the foregoing three devices, I find that the balanced turbine is embodied in the existing type of torpedo. In reaching this conclusion my criterion has been: do the essential features and function of the device appear? If they do, then mechanical alterations, although they add to its efficiency, or even improvements
935 which disclose invention, are immaterial.

A defense special to the balance turbine has been strenuously urged by the defendant. It appears that the balanced turbine was invented and patented by Lieutenant Commander G. C. Davison, U. S. N. He applied for a patent under date of Oct. 19, 1906; the patent was allowed on Dec. 6, 1906, and was issued under date of June 25, 1907. Meanwhile, on December 27, 1906, Davison had assigned to the United States Navy Department the full and exclusive right to his invention; and on or about January 10, 1907, the design, Exhibit 28, had been conveyed to the Bliss Company by the Government. In October, 1907, Davison applied for a patent in Great Britain, and in the following year patents were issued to him in that country and several others. These foreign patents were assigned by Davison to the defendant. Davison testified that he told the commandant of the torpedo station and the chief of the Bureau of Ordnance of these assignments to the defendant. On these facts the defendant contends that the Government waived the restrictive covenant. That covenant, it asserts, was nothing more than a secrecy clause, and the balanced turbine having been published to the world by the issue of the patents, it would be inequitable to forbid the defendant, the assignee of the foreign patents, the use of a device available to others. The obvious answer to this argument has already been pointed out. While some of the provisions of the restrictive clause directly prohibit disclosure, it is also expressly agreed that "the party of the first part will not make use of any device the design for which is furnished to it by the party of
936 the second part in any torpedo constructed or to be constructed for any person or for other governments." And even with respect to secrecy, it is apparent that there is no disclosure in the patent of what part, if any, of that invention is

embodied in Exhibit 28 or in the existing type of torpedo. It seems necessary to point out that this suit is based upon contract, not upon patent infringement. For the defendant has indulged in some reflections upon the futility of an injunction against it as the assignee of foreign patents for the balanced turbine. But the Government does not sue as the assignee of a patent limited to the territorial boundaries of the United States. It sues for an injunction to prevent the breach of a contract provision subject to no such territorial limitation.

The Government further contends that by virtue of the National Defense Act of 1911, the defendant should be restricted from disclosing, and therefore from making and selling torpedoes containing not only all the devices already considered, but several others (specified above) which, although suggested to the defendant by the complainant, with more or less particularity, were actually worked out by the defendant, and were not accompanied by any actual design or by the notice required by the restrictive covenant. I am of opinion that such a contention is not sound. The National Defense Act is a criminal statute, and a court of equity ordinarily has no jurisdiction to enjoin the commission of a crime. When, however, some interference, actual or threatened, with property or proprietary rights appears, the jurisdiction of a court of equity is not ousted by the fact that such interference is accompanied by or is itself a violation of the criminal law. If, in this instance, the exhibition and demonstration of the existing type of Bliss-Leavitt

torpedo to any other person or government be a violation
937 of the penal statute, doubtless the defendant would be subject to prosecution for the offense; if such exhibition and demonstration violates the property rights of the Government no doubt the court may grant such equitable relief as the case requires, but the fact that it was a violation of the criminal law would not be material to the consideration of equitable relief. Now, the complaint does not set up the violation of the penal statute as a separate cause of action, but avers that the defendant intends "thereby to violate the laws of the United States," and prays that the defendant be enjoined from violating such laws. But the court can grant relief in this case only to prevent a violation of the complainant's contract rights. And, apart from the rights acquired by the Government pursuant to the terms of the agreement, the Bliss-Leavitt torpedo is the defendant's property.

Inasmuch as the existing type of torpedo contains a device the design for which was furnished by the Government pursuant to contract, the complainant is entitled to a permanent injunction.

VAN VECHTER VEEDER, U. S. J.

Decree of May 5, 1914.

At a Stated Term of the District Court of the United States for the Eastern District of New York, held at the United States Court Rooms, in the Borough of Brooklyn, City of New York, on the fifth day of May, 1914.

Present: The Honorable Van Vechten Veeder, District Judge.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

This action having been begun by the filing of a bill of complaint herein, and the issuance of a subpoena on the 27th day of May, 1913, and an order to show cause why a temporary injunction should not issue, returnable the fourth day of June, 1913, having been at the same time granted herein, and an order having been signed by Honorable Van Vechten Veeder on the 14th day of June, 1913, amending the complaint herein, and a copy of the answer having been filed to the said amended complaint on the 17th day of June, 1913, herein, and a further order amending the said complaint having been signed by the Honorable Van Vechten Veeder on the 24th day of June, 1913, and an amended answer having been served therein, and an order having been granted on 939 the 23rd day of July, 1913, continuing the injunction during the pendency of this action, and issue having been thereupon duly joined, a trial of the issues in this case was begun on the 10th day of November, 1913, and continued until the 24th day of November, 1913, and the complainant and defendant having filed their briefs and reply briefs, and an oral argument having been had herein on the 9th day of January, 1914, and due deliberation having been thereupon had, and an opinion having been filed herein by the Honorable Van Vechten Veeder, Judge of the District Court on the 14th day of April, 1914.

Now, on reading and filing the said opinion, and on all the other papers and proceedings herein, and on the exhibits and testimony herein, it is hereby

Ordered, adjudged and decreed, that the defendant herein, its agents, servants, attorneys and employees, and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of what is known as the balanced turbine (either in its original form as specified in Exhibits 28 and 29 or in the form contained in Exhibit 27, being that form now used in the existing type of torpedo); and from communicating or exhibiting to any such

parties or governments the construction of, or exhibiting the performance of said balanced turbine, or of any torpedo or torpedoes which shall contain the same.

And it is

Further ordered, adjudged and decreed, that the complaint
940 herein be dismissed as to each and every other device and design therein mentioned, except such balanced turbine; and also, as to those portions of the complaint which charge the defendant with an intent to violate the laws of the United States, and the regulations of the Navy Department made in conformity therewith.

And it is further ordered, adjudged and decreed, that neither party is awarded any costs as against the other.

VAN VECHTEN VEEDER, U. S. J.

941

EXHIBIT C.

Opinion of Circuit Court of Appeals.

United States Circuit Court of Appeals for the Second Circuit.

UNITED STATES OF AMERICA, Complainant-Appellee,
against

E. W. BLISS COMPANY, Defendant-Appellant.

Before Coxe, Ward, and Rogers, Circuit Judges.

On cross appeals from a decree of the District Court for the Eastern District of New York. The defendant seeks to reverse that portion of the decree which restrains it from making use of the "balanced turbine" in any torpedo constructed for any corporation, individual or government other than the complainant, and from exhibiting or communicating to any such corporation, individual or government any torpedo which shall contain the said balanced turbine.

The complainant seeks to reverse that part of the decree which dismisses the bill and refuses an injunction as to other parts of the torpedo which the complainant contends were designed by its officers, agents and servants such, for instance, as ball bearings for the gyroscope.

942 The complainant also seeks to reverse the decree for the reason that the Court should have decided that the disclosure of any of the alleged novel constructions was a violation of the laws of the United States known as the National Defense Act of March 3, 1911.

ARTHUR C. FRASER,
ALBERT B. BOARDMAN,
FRANK H. PLATT AND
ROBERT H. EWELL,

For the Defendant-Appellant.

ARCHIBALD R. WATSON,
JOHN M. HARRINGTON AND
MELVILLE J. FRANCE,

For Complainant-Appellant.

COXE, J.:

Clause 19 of the contract of November 22nd, 1905, which became Clause 20 in the contract of June 12, 1912, is the clause out of which the controversy between the parties principally arises. The contract provides that the Bliss Company will make and deliver at Newport, Rhode Island, 300 torpedoes of the Bliss-Leavitt 5 meter 12-inch mark 1 type. The manufacture of these torpedoes is to conform to plans and specifications annexed to the contract and the work is to be done and the materials are to be furnished under the supervision of inspectors appointed by the Secretary of the Navy. When completed, the torpedoes are to be tested and need not be accepted by the Government unless they comply with all the requirements of the specification. Clause 19 also provides that the Bliss Company will not make use of any device the design for which is furnished by the United States, represented by the Bureau of Ordnance, in any torpedo constructed for any persons or governments, other than the United States. This clause further provides that the Bliss Company will not exhibit, describe or give information in regard to such devices to any firms, corporations or governments other than the United States. The Bliss Company

943 agrees that it will not exhibit any torpedo containing such device to any governments, or to their representatives, other

than the United States. In case of the breach of these provisions by the Bliss Company the United States shall be at liberty to cancel the contract and proceed with the manufacture of torpedoes contracted for in the agreement, including all improvements, without the payment of royalty, license fee or other charge on account of the use therein of any models, designs, devices, appliances or other features invented and communicated to the Bliss Company by the United States or its agents. The clause further provides that in case of any breach by the Bliss Company, all torpedoes with the designs, drawings, patterns, models and prepared material therefor on account of which payment in any amount shall have been made, shall become the property of the United States. Clause 19 concludes as follows:

"Provided furthermore, That no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause."

In 1912 another contract was made between the parties for the manufacture of one hundred and twenty additional torpedoes of the same type, in which it is stated that the torpedoes are to conform in all respects to the drawings referred to which are

944 not annexed to the contract for the reason that:

"They contain information of a confidential character that cannot be made public without detriment to the government's and

contractor's interests, and they are to be treated as confidential by the parties to this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract."

The bill alleges that the feature of the balanced turbine was invented by the officers composing the Bureau of Ordnance in 1906-7 and due notice thereof under clause nineteen was given to the defendant. That in like manner the complainant gave notice, through its agents, of changes in the vertical rudder, the method of starting the torpedo, in the engines, the fire gyro, the independent spin, the ball bearings of gyro and compound regulation of air.

This case illustrates the importance of a great government like the United States having a manufactory of its own for the manufacture of torpedoes and other implements of war which are improved and changed from time to time by the addition of ingenious mechanism which should clearly be kept secret, unless our enemies are to profit equally with ourselves in every improvement which the ingenuity of our army and navy officers may suggest. The futility of attempting by agreement to give to an outside contractor the benefit of such improvements as he may suggest while keeping secret other improvements in the same machine devised

945 by officers of the navy and their assistants, is demonstrated by the testimony in the case at bar. How is it possible for the Bliss Company to make public their own improvements and suggestions, in the construction of a given type of torpedo, and at the same time keep secret the suggestions and improvements made by the officers of the navy and their assistants? The defendant insists that all the improvements in controversy were suggested and embodied in working models by it or its employees. Mr. Leavitt, defendant's chief engineer, testifies that the defendant got no assistance whatever from the Government officials and that though they made many suggestions, not a single one was adopted by the Bliss Company. On the other hand, the Government insists that all of the improvements now in controversy were the result of the experiments made by the Bureau of Ordnance of the United States Navy.

Stated concretely the question now to be considered is whether or not the Bliss Company has a right to exhibit and sell to the representatives of foreign nations the so-called Bliss-Leavitt torpedo. We think it is clear that it cannot do so. The language of the nineteenth clause is clear and its purpose is obvious, viz., to keep secret the construction of any torpedo which contains a device the design for which is furnished by the United States or its agents and to bind the defendant not to disclose the performance of any torpedo containing such device to any one other than the United States. The contract must be construed in view of what must have been the intention of the United States. She was not engaged in procuring a perfected torpedo for the benefit of foreign nations. Her officers and experts were endeavoring to secure some device which was better than those possessed by foreign nations. That she should wish her

experiments kept secret is too obvious for argument. Indeed, it might almost be inferred without specific provisions. The contention of the defendant is very clearly stated in the letter of May 9, 1913, in which it says:

"We have repeatedly insisted that said article of the contract (Twenty) did not apply for the protection of any principle, but merely to 'any device the design for which was furnished for us by the Government'; that the specific design furnished has been and will be kept a secret; that the 'principle' having been made public by the grant by the Government of a patent for it, which patent the Government afterwards purchased, the 'principle' of the balanced turbine is no longer a confidential matter and we cannot be held to a secrecy which the Government has itself waived."

We think this takes too narrow and superficial a view of the matter and if followed will leave the Government practically remediless unless she makes her munitions of war in her own factories. It is true that the contents of the Davison patent were made public when the patent was issued, but the Government purchased it and no one can use its disclosures without infringing unless he has obtained a license so to do. "A principle" is not the subject of a patent except through the instrumentalities by which the principle is carried out. No one can secure a patent for the principle of striking the enemy's ship under water with a loaded torpedo. As the means disclosed by Davison's patent belong to the complainant, it is not easy to see what rights the defendant acquired by the granting of the Davison patent. If it owned the patent or if it were licensed under it, a different question would arise, but being, in a

sense, the confidential agent of the Government in the making of torpedoes, it acquired no rights adverse to those of the Government. We fail to see how the defendant has acquired a right to do what it promised it would not do so because a patent has been issued which makes public some of the methods and devices used in the manufacture of the Bliss-Leavitt torpedo. In this connection it is interesting to note that the defendant agreed with this view in December, 1912, when it wrote to the Bureau that the publication of the patents in no way prevented the real construction of the fundamental parts of the torpedo from being kept secret.

There can be no doubt, we think, that the balanced turbine was the invention of Lieutenant Commander Davison, acting for the United States, and that the Government did not lose the benefits of the invention because the patent subsequently issued in his name, and assigned to the Government, "disclosed" the invention to the world. Certainly the fact that foreign patents were issued which were subsequently purchased by the defendant did not give the defendant the right to make, use or sell the patented structure in this country without the license of the owner of the patent.

The contract of June 12, 1912 provides that the drawings, plans and specifications used by the defendant in making the Government torpedoes should not be disclosed to any one. Although the Bliss Company might sell torpedoes to other nations and individuals

it could not sell such torpedoes if they contained a device designed by the Government acting through its officers and experts.

Throughout the entire record, in the contracts, correspondence and dealings of the parties, the importance of secrecy is everywhere manifest. The nature of the services rendered was such that secrecy might almost be implied. It is difficult to imagine
948 a nation giving to one of its citizens contracts to manufacture implements necessary to the national defense and permitting that citizen to disclose the construction of such implement or sell it to another nation. The very nature of the service makes the construction urged by the defendant untenable. We are of the opinion, therefore, that the injunction should include all designs, drawings, plans and specifications used by the defendant in making the Bliss-Leavitt torpedo for the Government which were approved by the Ordnance Bureau, notice of which was given to the Bliss Company pursuant to the provisions of Clauses 19 and 20 of the contracts in question.

The decree should be amended by adding such a provision and, as so amended, it should be affirmed with costs.

949

EXHIBIT D—MANDATE.

Filed July 3, 1915.

UNITED STATES OF AMERICA, ss:

The President of the United States of America to the Honorable the Judges of the District Court of the United States for the Eastern District of New York, Greeting:

Whereas, lately in the District Court of the United States for the Eastern District of New York, before you, or some of you, in a cause between United States and E. W. Bliss Company, a decree was entered in the office of the Clerk of said Court on the 5th day of May, 1914, in the words and figures following, to-wit:

"This action having been begun by the filing of a bill of complaint herein, and the issuance of a subpoena on the 27th day of May, 1913, and an order to show cause why a temporary injunction should not issue, returnable the fourth day of June, 1913, having been at the same time granted herein, and an order having been signed by Honorable Van Vechten Veeder, on the 14th day of June, 1913, amending the complaint herein, and a copy of the answer having been filed to the said amended complaint on the 17th day of June, 1913, herein, and a further order amending the said complaint having been signed by the Honorable Van Vechten Veeder on the 24th day of June, 1913, and an amended answer having been served therein, and an order having been granted on the 23rd day of July, 1913, continuing the injunction during the pendency of this action, and issue having been thereupon duly joined, a trial of the issues in this case was begun on the 10th day of November, 1913, and contin-

ued until the 24th day of November, 1913, and the complain-
950 ant and defendant having filed their briefs and reply briefs,
and an oral argument having been had herein on the 9th day
of January, 1914, and due deliberation having been thereupon had,
and an opinion having been filed herein by the Honorable Van Vech-
ten Veeder, Judge of the District Court, on the 14th day of April,
1914.

Now, on reading and filing the said opinion, and on all the other
papers and proceedings herein, and on the exhibits and testimony
herein, it is hereby

Ordered, adjudged and decreed, that the defendant herein, its
agents, servants, attorneys, and employees, and all persons acting for
and in its behalf, be and they hereby are perpetually restrained and
enjoined from making use, on any torpedo or torpedoes, constructed
or to be constructed for any person or persons, firm, corporations or
others, or for other governments than the United States of America,
of what is known as the balanced turbine (either in its original form
as specified in Exhibits 28 and 29, or in the form contained in
Exhibit 27, being that form now used in the existing type of tor-
pedo), and from communicating or exhibiting to any such parties or
governments the construction of, or exhibiting the performance of
said balanced turbine, or of any torpedo or torpedoes which shall
contain the same.

And it is further ordered, adjudged and decreed, that the com-
plaint herein be dismissed as to each and every other device and
design therein mentioned, except such balanced turbine; and also as
to those portions of the complaint which charge the defendant with
an intent to violate the laws of the United States and the regulations
of the Navy Department, made in conformity therewith.

And it is further ordered, adjudged and decreed, that neither party
is awarded any costs as against the other.

VAN VECHTEN VEEDER.

U. S. J."

951 as by the inspection of the transcript of the record of the said
Court, which was brought into the United States Circuit Court
of Appeals for the Second Circuit, by virtue of an appeal and cross
appeal agreeable to the Act of Congress in such case made and pro-
vided, fully and at large appears.

And whereas, in the present term of October, in the year of our
Lord one thousand nine hundred and fifteen, the said cause came on
to be heard before the said United States Circuit Court of Appeals for
the Second Circuit, on the said transcript of record, and was argued
by counsel.

On consideration whereof, it is hereby

Ordered, adjudged and decreed, that the decree of said District
Court be and it hereby is amended in accordance with the opinion of
this Court and as so amended affirmed. It is further ordered that
the Judge of the District Court be and he is hereby instructed to
amend the decree in accordance with the opinion of this Court.

You, therefore, are hereby commanded that such further proceed-

be had in said cause, in accordance with the decision of this Court as according to right and justice, and the laws of the United States, ought to be had, the said appeal notwithstanding.

Witness, the Honorable Edward D. White, Chief Justice of the United States, the 2nd day of July, in the year of our Lord, one thousand nine hundred and fifteen.

[SEAL.]

WM. PARKIN,
*Clerk of the United States Circuit Court
of Appeals for the Second Circuit.*

952 EXHIBIT E—MEMORANDUM OF JUDGE VEEDER.

August 25, 1915.

United States District Court, Eastern District of New York.

THE UNITED STATES
vs.
THE E. W. BLISS COMPANY.

Memorandum on Settlement of Decree on Mandate.

Arthur C. Fraser, Albert B. Boardman, Frank H. Platt and Robert H. Ewell, for the Defendant-Appellant.

Archibald R. Watson, John H. Harrington and Melville J. France, for Complainant-Appellant.

Upon the settlement of the decree on the mandate of the Circuit Court of Appeals, which directed "that the Judge of the District Court be and he is hereby instructed to amend the decree in accordance with the opinion of this Court," counsel were at variance concerning the effect of the opinion of that Court. Thereupon, on July 19, 1915, with the approval of counsel, I addressed the following letter to Judge Coxe, at York Harbor, Maine:

953 "I am having some difficulty with the decree in the Bliss torpedo case. The parties differ radically concerning the scope of the amendment of my decree required by your opinion. As a practical matter, however, the only point upon which they are unable to reach any agreement is this: Did the Court intend to include the device for the compound regulation of air within the scope of the injunction?

The concluding sentence of your opinion reads:

'We are of the opinion, therefore, that the injunction should include all designs, drawings, plans and specifications used by the defendant in making the Bliss-Leavitt torpedo for the Government which were approved by the Ordnance Bureau, notice of which was given to the Bliss Company pursuant to the provisions of Clauses 19 and 20 of the contracts in question.'

I had found that designs for three devices had been furnished to the defendant, accompanied by the written notice required by Clauses

19 and 20; namely, the balanced turbine, ball bearings in the gyro-scope, and improvement in inside superheater. But, inasmuch as I had also found that of those devices the balanced turbine alone was embodied in the existing type of torpedo, my decree of injunction was limited to the balanced turbine.

The passage from your opinion, above quoted, is a clear direction to include within the scope of the injunction all three devices, designs for which had been supplied in accordance with Clauses 19 and 20. As I read the opinion this is as far as the Court intended to amend my decree, for my findings are nowhere expressly disturbed. Mr.

Watson contends, however, that the language of the opinion indicates that the Court intended to include the device for compound regulation of air, at least, within the injunction. Both parties attach much importance to this device, and I have, therefore, thought it best to submit the matter to you before signing a decree. I may add that this course is approved by both counsel."

On August 9, 1915, Judge Coxe replied:

"I have at last heard from all the members of the Court in the Torpedo Case, with the result that the majority is of the opinion that the devices for the compound regulation of air should be within the injunction."

In accordance with that direction the decree on mandate is now entered.

VAN VECHTEN VEEDER,
U. S. J.

955 EXHIBIT F—DECREE OF AUGUST 25, 1915.

At a Stated Term of the District Court of the United States of America for the Eastern District of New York, Held at the United States Court Rooms, in the Borough of Brooklyn, City of New York, on the 25th Day of August, 1915.

Present: The Honorable Van Vechten Veeder, District Judge.

UNITED STATES OF AMERICA, Complainant,
against
THE E. W. BLISS COMPANY, Defendant.

Decree on Mandate.

This cause having been tried before this Court, and a decree entered herein in the office of the Clerk of this Court, on the 5th day of May, 1914, from which decree an appeal and a cross-appeal were duly allowed and prosecuted in the United States Circuit Court of Appeals for the Second Circuit, from which Court a mandate bearing date July 2, 1915, and filed in said Clerk's office on July 3, 1915, has been duly issued to this Court, whereby the said decree was amended in accordance with the opinion of said United States Circuit Court of Appeals, and, as so amended, affirmed:

Thereupon, upon consideration thereof, it is hereby ordered, ad-

judged and decreed that the said decree of this Court be and it hereby is amended by striking therefrom the following provisions thereof, namely:

“Further Ordered, Adjudged and Decreed, that the complaint herein be dismissed as to each and every other device and design therein mentioned, except such balanced turbine; and also, as to those portions of the complaint which charge the defendant with an intent to violate the laws of the United States, and the regulations of the Navy Department made in conformity therewith,” and by substituting therefor the following, to wit:

1. “Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device for the double regulation of air, the design for which was furnished to the defendant by oral description and was referred to in letters respectively bearing date January 4, 1913, and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same.

2. “And it is Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of ball bearings for the gyroscope, embodied in Exhibits 52 and 53, furnished to the defendant on March 31, 1906, and referred to in said Bureau's letter to the defendant bearing said last named date and known as Exhibit 51; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of said last named device or of any torpedo or torpedoes that may contain the same.

3. “And it is Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of the inside superheater, embodied in Exhibits 55, 56 and 57, furnished to the defendant on September 18, 1906, and referred to in said Bureau's letter to the defendant bearing the last named date and known as Exhibit 54; and from communicating or exhibiting to any

958 such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same."

"And it is Further Ordered, Adjudged and Decreed that the complaint herein be dismissed as to each and every device and design therein mentioned except as to said balanced turbine and as to the additional devices referred to in paragraphs herein numbered 1, 2 and 3 respectively; and also as to those portions of the complaint which charge the defendant with a violation of the laws of the United States and the Regulations of the Navy Department made in conformity therewith."

VAN VECHTEN VEEDER,
U. S. J.

959 United States Circuit Court of Appeals for the Second Circuit, October Term, 1914.

No. 132.

Petition Filed October 2, 1915. Memo. Filed October 7, 1915.

Before Coxe, Ward, and Rogers, Circuit Judges.

UNITED STATES, Complainant-Appellant,
vs.

E. W. BLISS COMPANY, Defendant-Appellant.

Appeals from the District Court of the United States for the Eastern District of New York.

On Petition for Rehearing.

Per CURIAM:

When the question as to the device for the compound regulation of air arose the members of the court were so widely separated that oral consultation was out of the question. In the circumstances it was thought that the proper course to pursue was for the presiding judge to communicate by mail with the other members of the court, especially so as we understood both parties approved this course. However, as the defendant did not have an opportunity to be heard by this court upon the question of the inclusion in the decree
960 of the device for the compound regulation of air, it seems to us proper that such opportunity should now be given. The question is in exceedingly narrow limits and it seems to us that it can be treated more satisfactorily by submitting short written briefs; the defendant to have ten days to submit its views and the plaintiff an equal time to reply. If, however, an oral argument is desired, we will arrange for a date some time in the near future. As to the other grounds for a reargument set forth in the petition, the motion is denied.

961 At a Stated Term of the United States Circuit Court of Appeals for the Second Circuit, Held at the Court Rooms in the Post Office Building, City of New York, on the 18th day of October, 1915.

Present:

Hon. Alfred C. Coxe,

Hon. Henry G. Ward,

Hon. Henry Wade Rogers,

Circuit Judges.

UNITED STATES, Complainant-Appellant,

vs.

E. W. BLISS COMPANY, Defendant-Appellant.

A petition for a rehearing having been filed herein by counsel for the defendant;

Upon consideration thereof it is

Ordered that said petition be and hereby is denied except as to the question as to the device for the compound regulation of air.

Endorsed: United States Circuit Court of Appeals, Second Circuit, U. S. v. E. W. Bliss Co. Order. United States Circuit Court of Appeals, Second Circuit. Filed Oct. 18, 1915. William Parkin, Clerk.

962 United States Circuit Court of Appeals for the Second Circuit.

In Equity.

UNITED STATES OF AMERICA, Complainant,

against

E. W. BLISS COMPANY, Defendant.

Please take notice that the E. W. Bliss Company, defendant herein, will appear before the Honorable Judges of the Circuit Court of Appeals for the Second Circuit at the Post Office Building in the Borough of Manhattan, City of New York, on Monday the 4th day of October, 1915, at 10:30 o'clock in the forenoon, or as soon thereafter as counsel can be heard, and will then and there move, upon the affidavit hereto annexed and upon all of the papers, record and proceedings heretofore had herein, that the District Court for the Eastern District of New York may be directed to reform and amend the decree entered herein on or about August 25, 1915, by striking therefrom the following part thereof, so that the said decree will conform with the mandate entered herein on or about July 3, 1915:

"Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons

acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device for the double regulation of air, the design for which was furnished to the defendant by oral description and was referred to in letters respectively bearing date January 4, 1913, and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same,"

Or in the alternative that the said mandate be reformed and amended by adding thereto a direction to the said District Court for the Eastern District of New York to include within the decree the said device for the double regulation of air, and for such other and different or further relief as may be just and proper.

Dated New York, September 24, 1915.

ARTHUR C. FRASER,
Attorney for Defendant.

Office & Post Office Address, 170 Broadway, New York City.

To Melville J. France, Esq., United States Attorney, Brooklyn, N. Y.

964 United States Circuit Court of Appeals for the Second Circuit.

In Equity.

UNITED STATES OF AMERICA, Complainant,
against

E. W. BLISS COMPANY, Defendant.

STATE OF NEW YORK,

County of New York, ss:

Robert H. Ewell, being duly sworn, says:

1. I am of counsel for the defendant herein and am familiar with the proceedings herein.

2. The above entitled action in equity was commenced in the United States District Court for the Eastern District of New York in May, 1913, and was tried in November, 1913, before Hon. Van Vechten Veeder, United States District Judge, for the purpose of obtaining an injunction restraining the defendant, a West Virginia corporation, from selling to others than the United States Government torpedoes containing certain devices set forth in the complaint.

3. On April 14, 1914, Judge Veeder handed down his decision, in which he stated: "The bill of complaint sets forth four devices the design for which is claimed to have been furnished by the complainant to the defendant in accordance with the restrictive terms (as quoted above) of the contracts; (1) the balanced turbine, (2) ball bearings in the gyroscope, (3) superheater, and (4) compound air regulator." Judge Veeder then found as a fact that designs for the first three named devices were furnished to the defendant by the Government but he refused to find that any design was ever furnished for the fourth device mentioned, namely, a compound air regulator.

4. On May 5, 1915, a decree was entered pursuant to said decision of Judge Veeder.

5. Thereafter cross appeals were taken by the parties in the above entitled action to this Court and the decision of this Court was handed down on June 8, 1915.

The opinion of this Court does not in any way intimate that any findings of fact made by the trial court are to be reversed or in any way modified.

6. On July 3, 1915, the mandate of this Court was issued which provided:

"On consideration whereof, it is hereby

"Ordered, adjudged and decreed, that the decree of said District Court be and it hereby is amended in accordance with the opinion of this court and as so amended, affirmed. It is further ordered that the Judge of the District Court be and he is hereby instructed to amend the decree in accordance with the opinion of this Court.

"You, therefore, are hereby commanded that such further proceedings be had in said cause, in accordance with the decision of this court as according to right and justice, and the laws of the United States, ought to be had, the said appeal notwithstanding."

7. Thereafter Judge Veeder wrote to Judge Cox on July 19, 1915, and Judge Cox replied on August 9, 1915, and on August 25, 1915. Judge Veeder filed a memorandum in the District Court for the Eastern District of New York, a copy of which is hereto annexed marked "Exhibit A."

It appears from the letter of Judge Veeder that he did not understand from the formal opinion of this Court whether the Court intended to include the double air regulator within the injunction. It appears from the reply of Judge Cox that a majority of this Court was of the opinion that said device should be included. Judge Cox, however, did not state in his letter that this Court made or intended to make an original finding of fact that a design for a double air regulator was ever furnished. Judge Veeder, however, apparently understood that he was left no discretion in the matter and that he was not to enter a decree in accordance with his own findings of fact and he considered the informal expression of opinion on the part of Judge Cox as an absolute direction to include the double air regulator within the injunction, just as if such a direction had been included in the mandate.

8. On August 25, 1915, Judge Veeder signed a decree, a copy of which is hereto annexed, marked "Exhibit B."

In this decree the defendant is enjoined from using "the device for the double regulation of air, the design for which was furnished to the defendant by oral description and was referred to in letters respectively bearing date January 4, 1913, and January 18, 1913, and known as Exhibits 64 and 65."

The decree thus is based upon an assumed fact that an oral
967 description of some design for a double air regulator was furnished and is in direct conflict with the findings of fact made by Judge Veeder. The decree appears to be in conflict with the opinion of this Court and with the mandate entered thereon because neither contains any direction by this Court to include the double air regulator within the injunction, or, in any way, to alter, modify or enlarge the findings of fact of the trial court.

9. The defendant intends to appeal to the Supreme Court from the decree herein, and it is, therefore, important to have the record clear so that there may be no possible doubt as to whether the decree is in harmony with the mandate and intent of this Court. Depo-
nent, therefore, respectfully requests that the District Court for the Eastern District of New York may be directed to reform the decree by striking therefrom the clause as to the double air regulator, so as to conform to the mandate, or, in the alternative, that the mandate herein be amended and reformed by inserting therein a direction to include the double air regulator within the decree, so as to conform to the decree.

10. No previous application has been made to this Court or to any Court for the relief herein sought.

ROBERT H. EWELL.

Sworn to before me this 24th day of September, 1915.

[SEAL.]

ADELE F. SHAW,

Notary Public, Kings Co., No. 67.

Certificate filed in New York Co.

N. Y. Co. No. 56, N. Y. Register No. 6192.

Kings Co. Register No. 6077.

968

EXHIBIT A.

Memorandum of Judge Veeder.

August 25, 1915.

United States District Court, Eastern District of New York.

THE UNITED STATES

VS.

THE E. W. BLISS COMPANY.

Memorandum on Settlement of Decree on Mandate.

Arthur C. Fraser, Albert B. Boardman, Frank H. Platt and Robert H. Ewell, for the defendant-appellant.

Archibald R. Watson, John H. Harrington and Melville J. France, for complainant-appellant.

Upon the settlement of the decree on the mandate of the Circuit Court of Appeals, which directed "that the Judge of the District Court be and he is hereby instructed to amend the decree in accordance with the opinion of this Court," counsel were at variance concerning the effect of the opinion of that Court. Thereupon, on July 19, 1915, with the approval of counsel, I addressed the following letter to Judge Cox, at York Harbor, Maine:

"I am having some difficulty with the decree in the Bliss torpedo case. The parties differ radically concerning the scope of the amendment of my decree required by your opinion. As a practical matter, however, the only point upon which they are unable to reach any agreement is this: Did the Court intend to include the device for the compound regulation of air within the scope of the injunction?"

The concluding sentence of your opinion reads:

969 "We are of the opinion, therefore, that the injunction should include all designs, drawings, plans and specifications used by the defendant in making the Bliss-Leavitt torpedo for the Government which were approved by the Ordnance Bureau, notice of which was given to the Bliss Company pursuant to the provisions of Clauses 19 and 20 of the contracts in question."

I had found that designs for three devices had been furnished to the defendant, accompanied by the written notice required by Clauses 19 and 20; namely, the balanced turbine, ball bearings in the gyroscope, and improvement in inside superheater. But, inasmuch as I had also found that of those devices the balanced turbine alone was embodied in the existing type of torpedo, my decree of injunction was limited to the balanced turbine.

The passage from your opinion, above quoted, is a clear direction to include with the scope of the injunction all three devices, designs for which had been supplied in accordance with Clauses 19

and 20. As I read the opinion this is as far as the Court intended to amend my decree, for my findings are nowhere expressly disturbed. Mr. Watson contends, however, that the language of the opinion indicates that the Court intended to include the device for compound regulation of air, at least, within the injunction. Both parties attach much importance to this device, and I have, therefore, thought it best to submit the matter to you before signing a decree. I may add that this course is approved by both counsel."

On August 9, 1915, Judge Coxe replied:

"I have at last heard from all the members of the Court in the Torpedo Case, with the result that the majority is of the opinion that the devices for the compound regulation of air should be within the injunction."

In accordance with that direction the decree on mandate is now entered.

VAN VECHTEN VEEDER, U. S. J.

970

EXHIBIT B.

Decree of August 25, 1915.

At a Stated Term of the District Court of the United States of America for the Eastern District of New York, held at the United States Court Room, in the Borough of Brooklyn, City of New York, on the 25th day of August, 1915.

Present: The Honorable Van Vechten Veeder, District Judge.

UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

Decree on Mandate.

This cause having been tried before this Court, and a decree entered herein in the office of the Clerk of this Court, on the 5th day of May, 1914, from which decree an appeal and a cross-appeal were duly allowed and prosecuted in the United States Circuit Court of Appeals for the Second Circuit, from which Court a mandate bearing date July 2, 1915, and filed in said Clerk's office on July 3, 1915, has been duly issued to this Court, whereby the said decree was amended in accordance with the opinion of said United States Circuit Court of Appeals, and, as so amended, affirmed:

Thereupon, upon consideration thereof, it is hereby ordered, adjudged and decreed that the said decree of this Court be and 971 it hereby is amended by striking therefrom the following provisions thereof, namely:

"Further Ordered, Adjusted and Decreed, that the complaint herein be dismissed as to each and every other device and design therein mentioned, except such balanced turbine; and also, as to those portions of the complaint which charge the defendant with

intent to violate the laws of the United States, and the regulations of the Navy Department made in conformity therewith.

and by substituting therefor the following, to wit:

1. "Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others for other governments than the United States of America, of the device for the double regulation of air, the design for which was furnished to the defendant by oral description and was referred to in letters respectively bearing date January 4, 1913, and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same.

"And it is Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America of the device disclosed by the naval design of ball bearings for the gyroscope, embodied in Exhibits 52 and 53, furnished to the defendant on March 31, 1906, and referred to in said Bureau's letter to the defendant bearing said last named date and known as Exhibit 51; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of said last named device or of any torpedo or torpedoes that may contain the same.

3. "And it is Further Ordered, Adjudged and Decreed, that the defendant herein, its agents, servants, attorneys and employees and all persons acting for and in its behalf be and they hereby are perpetually restrained and enjoined from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of the inside superheater, embodied in Exhibits 55, 56, and 57, furnished to the defendant on September 18, 1906, and referred to in said Bureau's letter to the defendant bearing the
972 last named date and known as Exhibit 54; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same."

"And it is Further Ordered, Adjudged and Decreed that complaint herein be dismissed as to each and every device and design therein mentioned except as to said balanced turbine and as to the additional devices referred to in paragraphs herein numbered 1, 2 and 3 re-

spectively; and also as to those portions of the complaint which charge the defendant with a violation of the laws of the United States and the Regulations of the Navy Department made in conformity therewith."

VAN VECHTEN VEEDER, *U. S. J.*

Endorsed: United States Circuit Court of Appeals for the Second Circuit. United States of America, Complainant, against E. S. Bliss Company defendant. Motion to reform the decree or in the alternative the mandate. Arthur C. Fraser attorney for defendant 170 Broadway, New York City. Service of copy admitted Sept. 24, 1915. Melville J. France, U. S. Att'y. Archibald R. Watson, Deputy Att'y Gen'l. United States Circuit Court of Appeals Second Circuit Filed Nov. 22, 1915. William Parkin, Clerk.

973 United States Circuit Court of Appeals for the Second Circuit,
October Term, 1915.

No. 132.

Re-Argued November 22, 1915. Decided December 14, 1915.

Appeals from the District Court of the United States for the Eastern
District of New York.

Before:

Coxe, Ward and Rogers,
Circuit Judges.

THE UNITED STATES OF AMERICA, Complainant-Appellant,
vs.

THE E. W. BLISS, COMPANY, Defendant-Appellant.

Upon reargument of the issue relating to the double regulation
of air.

Melville J. France, United States Attorney.

Archibald R. Watson, Special Assistant to the Attorney General.

John M. Harrington, of Counsel.

Arthur C. Fraser, Solicitor for Defendant.

Arthur C. Fraser, Frank H. Platt, Robert H. Ewell, of Counsel
for Defendant.

974 COXE, J.

The defendant's contention upon the issues now before the Court, if successful, may result in rendering the entire decree abortive. It does not seem to be seriously disputed that if the defendant be permitted to make the device for the double regulation of air it cannot logically be enjoined from making the balanced turbine. The issue is more important, therefore, than a mere statement of

it would indicate. The question, broadly stated, is whether the contract is to be so literally construed that no improvement, however simple in construction, suggested by the Bureau, can be regarded as belonging to the complainant unless a blue print or working drawing has been furnished at or prior to giving the notice. It is clear that the contract should not be so strictly construed as to require the officers of the Bureau of Ordnance to do a vain and unnecessary thing. A common sense construction is all that is required. If the defendant is put in possession of all the facts so that misconception is impossible it should be sufficient. Of course where the proposed change involves a complicated structure or device a blue print drawing or a model is necessary, but where the mechanical change is so simple that an ordinary artisan will know what to do the moment the change is directed, it is not perceived how any additional advice is necessary. If the ordnance officer directs the mechanic to make a valve an inch wider or add an additional valve, indicating the place where it is to be inserted, we do not think a blue print is necessary to make plainer what is perfectly plain without it.

That the defendant's officers had due notice of the complainant's position as to the double regulation of air, and that they thoroughly understood it, is not disputed. No blue print was furnished but the Bureau offered to furnish the defendant with cards and data obtained by experiments at the Torpedo Station for the information of the defendant if it desired and requested it. It did not request it. There can be no doubt that the defendant fully understood the Government's contention regarding the necessity for a double regulation of air. There was no complaint that the Bureau's request for another valve was not fully understood. The
975 defendant's sole objection seems to have been not that there was any difficulty in making the change but that it would not accomplish the desired result. The defendant's vice-president was asked and answered the following question:

Q. "In reference to the double air regulation, the Bliss Co. finally adopted the double air regulator after it had been urged to do so by the Bureau and the Inspector of Ordnance at your works for some time, did they not? A. Yes, they did."

It seems obvious that the defendant clearly understood what was wanted by the Ordnance Bureau. It made no complaint of lack of details, asked for no additional information and opposed the scheme on the ground that in the opinion of defendant's experts the plan would not work.

Briefly the situation was practically this—The Bureau officers said to the Bliss Co's. officer, "You need another valve, put it here"—indicating the place on the drawing or model where the second valve was to be inserted. This was done and with the result that the defect was remedied. Can it be that the complainant is to lose the benefit of this improvement because its agents did not go through the wholly inconsequential ceremony of furnishing a blue print? The defendant had itself indicated when a similar situation arose with reference to the starting mechanism, that the mere suggestion

by the Bureau of the use of a breaking tube which solved the difficulty, would have made that device the sole property of the complainant. We have only to substitute the words "an additional valve" for the words "breaking tube" and we have the opinion of the defendant itself that the device for the double regulation of air is the property of the United States. The defendant did not need a model or a blue print to inform it where to place the second valve and does not now pretend that such information was asked for or was necessary any more than the blue print of a breaking tube was necessary in the hypothetical case suggested by the defendant.

We think the decree as entered is correct and should not be disturbed.

Ward, J., dissents.

976 At a stated term of the United States Circuit Court of Appeals for the Second Circuit, held at the court rooms in the Post-Office Building, City of New York, on the 24th day of December, 1915.

Present:

Hon. Alfred C. Coxe, Hon. Henry G. Ward, Hon. Henry Wade Rogers, Circuit Judges.

THE UNITED STATES, Complainant-Appellant,

vs.

THE E. W. BLISS COMPANY, Defendant-Appellant.

A petition for a rehearing having been granted herein upon a single point, and upon such rehearing a motion having also been made to recall and amend the mandate heretofore issued herein;

Upon consideration thereof it is

Ordered that the former decision of this court herein be and hereby is affirmed and said motion denied.

Endorsed: United States Circuit Court of Appeals, Second Circuit. U. S. v. E. W. Bliss Co. Order. United States Circuit Court of Appeals, Second Circuit. Filed Dec. 27, 1915. William Parkin, Clerk.

A. C. C.

977 United States Circuit Court of Appeals, Second Circuit.

In Equity.

THE UNITED STATES OF AMERICA, Complainant and Appellee,
against
E. W. BLISS COMPANY, Defendant and Appellant.

Appeal.

To the Honorable the Supreme Court of the United States:

The appeal of the above named defendant and appellant respectfully sheweth:

That upon the 27th day of May, 1913 complainant filed its bill of complaint in the United States District Court for the Eastern District of New York, against the above named defendant and appellant, E. W. Bliss Company, in a suit in Equity setting up amongst other things certain contracts between complainant and defendant relating to the manufacture of torpedoes by defendant for complainant, and wherein it was provided in substance that defendant should not make use of any device, the design for which was furnished to it by complainant and of which defendant should be notified that it came under said contracts, in any torpedo for sale to others than complainant or disclose such device to others, and in which bill it was further alleged as follows:

978 That in accordance with the terms of said contracts complainant had communicated to defendant designs for the following devices:

1. Balanced Turbine.
2. Super heater.
3. Changes in the type of after body.
4. Changes in the location and in the area of the vertical rudders.
5. Changes in the method of starting torpedoes.
6. Changes in the type of depth of engines.
7. Changes in the curve fire gyro and the independent spin principle.
8. Ball Bearings for Gyros.
9. Compound Regulation of Air.

That said bill further alleged that defendant intended to violate the terms of said contracts by selling to others than complainant torpedoes containing said devices and communicating knowledge thereof to others, and prayed that the writs of injunction and of subpoena might be issued against said defendant, its officers, servants, agents and employees.

This defendant and appellant further shows that pursuant to said prayer a subpoena ad respondendum issued out of and under the seal of the District Court and was duly served on said defendant, E. W. Bliss Company.

This defendant and appellant further shows that thereafter the said defendant E. W. Bliss Company answered the said bill of com-

plaint by filing its answer thereto, wherein amongst other things it
in substance admitted the said contracts, but denied that it
979 intended to violate the same, and wherein defendant admitted
that it was negotiating with and intended to sell torpedoes to
parties other than complainant but denied that thereby it would vio-
late the terms of said contracts, and denied that defendant intended
to violate the terms of said contracts, and denied that the devices set
up in the bill came within the terms of said contracts. That there-
after the said suit came on for trial and was tried in open court
before His Honor Judge Veeder, and such proceedings had that on
May 5, 1914 a final decree was entered in said District Court wherein
it was in substance amongst other things adjudged and decreed that
a perpetual injunction issue against defendant as to the balanced
turbine, and that the bill be dismissed as to every other device or
design mentioned in the bill of complaint.

This defendant and appellant further shows that thereafter the
complainant and defendant by appeal and cross appeal, respectively,
appealed from said decree to the United States Circuit Court of
Appeals for the Second Circuit, and that such proceedings were had
that said Court in and by a decree filed in said Court July 2, 1915
ordered that the decree of said District Court be amended in accord-
ance with the opinion of said Circuit Court of Appeals and as so
amended affirmed. That thereafter the mandate of the said United
States Circuit Court of Appeals in accordance with said decree of July
2, 1915 was duly issued and filed in said District Court, and said
District Court in and by a final decree dated August 25, 1915
amended its decree of May 5, 1914 by striking therefrom the pro-
visions dismissing the bill of complaint as to all the other devices
and designs therein mentioned except the balanced turbine,
980 and by adding thereto provisions ordering injunctions
against said defendant as to

1. The double regulation of air,
2. Ball bearings for gyroscope,
3. Inside super heater.

and a provision dismissing the bill as to every other device or
design mentioned in said bill except the balanced turbine and the
three devices mentioned and numbered 1, 2 and 3. This defendant
and appellant further shows that thereafter upon petition the said
Circuit Court of Appeals granted a rehearing as to the inclusion in
said decree of the District Court of August 25, 1915 of the device for
the double regulation of air and that such case was thereafter re-
heard by said Court and that on such rehearing a motion was made
to recall and amend the said mandate of said court; that thereafter
the majority of the Court rendered its opinion approving the said
decree of August 25, 1915 as entered, and thereafter the said Circuit
Court of Appeals in and by a decree and order filed in said Court
December 27, 1915, affirmed its said Decree of July 2, 1915 and
denied the said motion.

Wherefore this appellant appeals from the whole of said decrees
of the United States Circuit Court of Appeals for the Second Circuit,
filed July 2, 1915 and December 27, 1915, to the Supreme Court of
the United States, and respectfully prays that the said decrees of the

United States Circuit Court of Appeals for the Second Circuit, together with the bill of complaint, answer, depositions, evidence, exhibits, decrees and proceedings in said cause may be sent to the United States Supreme Court without delay, and that the United States Supreme Court will proceed to hear said cause anew and that the decrees of the United States Circuit Court of Appeals for the Second Circuit and every part thereof may be reversed with costs, and that the said bill of complaint may be dismissed or such other decree made as the United States Supreme Court shall deem just.

ARTHUR C. FRASER,
Of Counsel.

Endorsed: U. S. Circuit Court of Appeals, Second Circuit. In Equity. United States of America v. E. W. Bliss Company. Appeal. Arthur C. Fraser, Solicitor for Defendant, 170 Broadway (Manhattan), New York, N. Y. United States Circuit Court of Appeals, Second Circuit. Filed Jan. 28, 1916. William Parkin, Clerk.

H./R. W.—B.

982

Bond.

United States Circuit Court of Appeals, Second Circuit.

In Equity.

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

Know all men by these presents:

That we, Casualty Company of America, of 133 William Street, New York City, a corporation of the State of New York, duly authorized to transact business pursuant to the Act of Congress approved August 13, 1894, is held and firmly bound unto the United States of America, in the full and just sum of Five Hundred Dollars (\$500.) lawful money of the United States, to be paid to the United States of America, its legal representatives or assigns; to which payment, well and truly to be made, the said Company binds itself, its successors and assigns, jointly and severally, firmly by these presents.

Dated, New York, — — —.

Whereas the above named defendant, E. W. Bliss Company, has prosecuted an appeal to the United States Supreme Court, to reverse the decrees rendered in the above entitled suit by the United States Circuit Court of Appeals for the Second Circuit.

Now, Therefore, the condition of the above obligation is such that if the said E. W. Bliss Company shall prosecute said appeal to effect,

983 and answer all costs if it fail to make said plea good, then the above obligation to be void; else to remain in full force and virtue.

CASUALTY COMPANY OF AMERICA,
By CHESTER E. BATES,
Resident Vice-President.

Attest:

[SEAL.] WILLIAM PALGLASE.
Resident Assistant Secretary.

H./R. W.

Form No. 2252-2M-10-12.

United States Government Justification.

984 STATE OF NEW YORK,
County of New York, ss:

On this 19th day of January, 1916, before me personally came William Palglase known to me to be the Res. Asst. Secretary of Casualty Company of America, the corporation described in and which executed the annexed bond on behalf of E. W. Bliss Company and the said William Palglase being by me duly sworn, did depose and say that he resides in the City of New York, State of New York that he is Resident Assistant Secretary of said Company, and knows the corporate seal thereof; that the seal affixed to the said annexed instrument is such corporate seal, and was thereto affixed by order and authority of the Board of Directors of said Company, and that he signed said annexed instrument as Resident Assistant Secretary of said Company by like order and authority; and that he is acquainted with Chester E. Bates and knows him to be the Resident Vice-President of said Company, and that the signature of said Chester E. Bates subscribed to said annexed instrument, is in the genuine hand writing of said Chester E. Bates and was thereto subscribed, by order and authority of said Board of Directors, and in the presence of said deponent; and that said Company is duly and legally incorporated under the laws of the State of New York, and has complied with the provisions of the Act of Congress of August 13, 1894, as amended by act of Congress of March 23, 1910, allowing certain corporations to be accepted as surety on bonds; and that the assets of said Company, unencumbered and liable to execution, exceed its debts, claims and liabilities of every nature whatsoever, by more than the sum of four hundred thousand dollars, and that the attached statement of said Company's assets and liabilities, signed by deponent, is true and correct, and is a copy of the last statement of the assets and liabilities of said Company, as rendered to the Secretary of the Treasury of the United States, pursuant to the foregoing acts of Congress.

[SEAL.]

JOS. H. PHELPS,
Notary Public #1612, New York County.

Resolutions.

"Resolved, that the President or a Vice-President or Acting Vice-President and the Secretary, an Assistant Secretary, or an Acting Secretary of the Casualty Company of America, be and they hereby are authorized and empowered, to execute and deliver, and attach the seal of the Company, to any and all bonds or other obligations, for and on behalf of the Company; further

Resolved, that the President or a Vice-President, in conjunction with the Secretary or an Assistant Secretary of the Casualty Company of America, may from time to time, appoint Resident Vice-Presidents, Resident Assistant Secretaries and Attorneys in Fact, to represent and act for and on behalf of the Company, and the President or a Vice-President or the Secretary, the Board of Directors or the Executive Committee, may at any time, remove any such Resident Vice-President, Resident Assistant Secretary or Attorney in Fact, and revoke the power and authority given him; further

Resolved, That Resident Vice-Presidents, in conjunction with the Secretary or an Assistant Secretary or a Resident Assistant Secretary, and Attorneys in Fact, may be given full power and authority to execute for, and in the name, and on behalf of the Company, any and all bonds, recognizances, contracts of indemnity and other writings, obligatory in the nature of a bond, recognizance or conditional undertaking, and any such instrument, executed in such manner, shall be as binding upon the Company, as if signed by the President, and sealed and attested by the Secretary."

STATE OF NEW YORK,

County of New York, ss:

I, William Palglase, Res. Asst. Secretary of Casualty Company of America have compared the foregoing resolutions with the originals thereof, as recorded in the Minute Book of said Company, and do hereby certify that the same is a correct and true transcript therefrom, and of the whole of said original resolutions, which were duly adopted by the Board of Directors, under date of February 20, 1912. Given under my hand and seal of the Company, at the City of New York, this 19th day of January, 1916.

[SEAL.]

WILLIAM PALGLASE,

Res. Asst. Secretary.

Endorsed: United States Circuit Court of Appeals. United States of America v. E. W. Bliss Company. Bond. I approve of the within bond and of the sufficiency of the surety therein. Dated January 28, 1916. Alfred C. Core. United States Circuit Court of Appeals, Second Circuit. Filed Jan. 28, 1916. William Parkin, Clerk.

985 United States Circuit Court of Appeals, Second Circuit.

In Equity.

UNITED STATES OF AMERICA, Complainant-Appellee,
against
E. W. BLISS COMPANY, Defendant-Appellant.

STATE OF NEW YORK,
County of Kings, ss:

Frank C. B. Page, being duly sworn deposes and says:

I am Vice-President of the E. W. Bliss Company, the above named defendant, and have been such for a number of years. I am familiar with the matters at issue in this suit.

By the decree of the District Court of the United States, for the Eastern District of New York, herein entered May 5, 1914, as amended by the decree of said court dated August 25, 1915, the defendant is enjoined from the use of the following devices, to wit,

1. Balanced Turbine
2. Double Regulation of Air
3. Ball Bearings for Gyroscope
4. Inside Superheater

in torpedoes which are to be sold to any other party or government than the complainant.

The matter in controversy in this suit is the defendant's right to employ such devices in connection with torpedoes made for
986 other parties or governments than the complainant. The value of the said matter in controversy outside of any costs that might be adjudged in this case is vastly in excess of One Thousand Dollars (\$1000.).

F. C. B. PAGE.

Subscribed and sworn to before me this 12th day of January, 1916.

[SEAL.]

MOSES ARONSON,
Notary Public No. 83,
Kings County, New York.

87 United States Circuit Court of Appeals, Second Circuit.

In Equity.

UNITED STATES OF AMERICA, Complainant-Appellee,
against
E. W. BLISS COMPANY, Defendant-Appellant.

Order.

It appearing to the Court that the value of the matter in controversy is in excess of the sum of One Thousand Dollars (\$1000.) besides costs, it is therefore hereby

Ordered, Adjudged and Decreed by the Court that the defendant, E. W. Bliss Company be allowed an appeal from the decrees of this Court dated July 2, 1915, and December 27, 1915, to the United States Supreme Court.

Dated New York, January 28th, 1916.

ALFRED C. CORE,
*Judge of the United States Circuit Court of
Appeals for the Second Circuit.*

Endorsed: U. S. Circuit Court of Appeals, Second Circuit. In Equity. United States of America v. E. W. Bliss Company. Affidavit and Order allowing appeal. Arthur C. Fraser. Solicitor for Defendant, 170 Broadway (Manhattan) New York, N. Y. United States Circuit Court of Appeals, Second Circuit. Filed Jan. 28, 1916. William Parkin, Clerk.

988 *Assignment of Errors.*

United States Circuit Court of Appeals, Second Circuit.

In Equity.

UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

The above named defendant E. W. Bliss Company, Appellant, makes the following assignment of errors in the above entitled cause in the decrees entered therein on the second day of July, 1915, and on the twenty-seventh day of December, 1915.

1. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of what is known as the Balanced Turbine in its original form as specified in the Exhibits 28 and 29; and from communicating or exhibiting to any

such parties or governments the construction of, or exhibiting the performance of, said Balanced Turbine or of any torpedo or torpedoes which shall contain the same.

2. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of what is known as the Balanced Turbine in the form contained in Exhibit 27, being that form now used in the existing type of torpedo; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said Balanced Turbine or of any torpedo or torpedoes which shall contain the same.

3. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device for the Double Regulation of Air; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device, or of any torpedo or torpedoes which shall contain the same.

4. That the Court erred in holding that defendant was furnished with a design of a device for the Double Regulation of Air by oral description.

5. That the Court erred in holding that letters dated respectively January 4, 1913 and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant, referred to a design for a device for the Double Regulation of Air furnished to defendant by complainant.

6. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of Ball Bearings for the Gyroscope embodied in Exhibits 52 and 53, furnished to the defendant on March 31, 1906 and referred to in said Bureau's letter to the defendant bearing said last named date and known as Exhibit 51, and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same.

7. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of the Inside Superheater embodied in Exhibits 55, 56 and 57 furnished to the defendant on September 18, 1906 and referred to in said Bureau's letter to the defendant bearing the last named date and known as Exhibit 54, and from

communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same.

8. That the Court erred in excluding, over the defendant's objection and exception, evidence that no claim was made by the Government, or its officers, that the Balanced Turbine was covered by the 19th clauses of the contracts between the contract of November 22, 1905, and that of June 12, 1912, when the said intervening contracts were negotiated and made.

9. That the Court erred in not holding that at the time the complainant is held to have furnished defendant the design for Balanced Turbine, the device shown in the said design was old and well known and that therefore it was not a device which was included in Clause 19 of the 1905 contract.

10. That the Court erred in not holding that at the time the complainant is held to have furnished defendant the design for Balanced Turbine, the said design was then in the possession of defendant and had been theretofore used by it, and that therefore it was not a design which was included in clause 19 of the 1905 contract.

11. That the Court erred in not holding that the publication of the design for the Balanced Turbine in the Davison patent No. 858,266, issued June 25, 1907 (being subsequent to the date when a design therefore is held to have been furnished by complainant to defendant), relieved defendant from the restrictive provisions of the contract under which the said design is held to have been furnished defendant, or the contract of June 12, 1912, as to such Balanced Turbine.

12. That the Court erred in not holding that the defendant by acquiring Davison's foreign patents with the knowledge and acquiescence of the complainant, thereby became entitled to manufacture, sell and use in foreign countries, and to disclose, the Balanced Turbine for torpedoes as set forth in said foreign patents, and that thereby the complainant waived any right which the complainant might otherwise have had under the contracts between the parties to restrain the defendant from such foreign manufacture, sale and use, and such disclosure.

13. That the Court erred in not holding that defendant could freely disclose the design for Balanced Turbine as contained in the existing type of torpedo without violation of the complainant's rights.

14. That the Court erred in not holding that defendant could freely disclose the design for the device for the Double Regulation of Air as contained in the existing type of torpedo without violation of the complainant's rights.

15. That the Court erred in not holding that clause 19 in the 1905 contract between complainant and defendant, and clause 20 in the 1912 contract, were limited to devices which originated with or were the exclusive property of the complainant and were by it furnished to defendant.

16. That the Court erred in not dismissing the bill of complaint
17. That the Court erred in not awarding defendant costs.

ARTHUR C. FRASER,
Counsel for Defendant-Appellant.

Endorsed: U. S. Circuit Court of Appeals, Second Circuit. In Equity. United States of America v. E. W. Bliss Company. Assignment of Errors. Arthur C. Fraser, Solicitor for Defendant, 170 Broadway (Manhattan), New York, N. Y. United States Circuit Court of Appeals, Second Circuit. Filed Jan. 28, 1916. William Parkin, Clerk.

H/A/R. W.-B.

993 United States Circuit Court of Appeals for the Second Circuit.

UNITED STATES OF AMERICA, Plaintiff,

E. W. BLISS COMPANY, Defendant.

In Equity.

It is hereby stipulated and agreed by and between the attorneys for the respective parties hereto that the clerk of this court may include in the transcript of record herein on appeal to the Supreme Court of the United States the following additional exhibits, to wit: Plaintiff's Exhibits Nos. 44, 45, 46, 47, 48.

Defendant's Exhibits Nos. 116, 118, 119, 120, 122, 123, 124, 125, 126, 127, 137 and 138.

MELVILLE J. FRANCE,
Plaintiff's Attorney.
ARTHUR C. FRASER,
Defendant's Attorney.

Dated New York, February 10, 1916.

So ordered—

A. C. C., U. S. C. J.

Endorsed: U. S. Circuit Court of Appeals for the second circuit. In Equity. United States of America, plaintiff, vs. E. W. Bliss Company, defendant. Stipulation. Arthur C. Fraser, solicitor for defendant. 170 Broadway, New York, N. Y. United States Circuit Court of Appeals Second Circuit Filed Feb. 23, 1916. William Parkin, Clerk.

994 *United States Circuit Court of Appeals for the Second Judicial Circuit.*

UNITED STATES OF AMERICA
against
E. W. BLISS COMPANY.

In Equity.

To the Honorable Judges of the United States Circuit Court of Appeals for the Second Judicial Circuit:

The petition of the above named complainant respectfully shows:

The above named complainant, conceiving itself aggrieved by the decree made and entered in the above entitled cause and filed in the Office of the Clerk of this Court on the 2nd day of July, 1915, does hereby appeal therefrom to the Supreme Court of the United States, for the reasons specified in the Assignment of Errors filed herewith, and prays that its appeal may be allowed and that a transcript of the record papers and proceedings upon which said appeal was made, duly authenticated, may be sent to the Supreme Court of the United States.

Dated, New York, March 3, 1916.

MELVILLE J. FRANCE,
United States Attorney,
Post-office Building, Brooklyn, New York.

The foregoing petition on appeal is hereby granted.

Dated, New York, March 3, 1916.

ALFRED C. COXE,
United States Circuit Judge.

995 (Endorsed:) United States Circuit Court of Appeals for the Second Judicial Circuit. United States of America against E. W. Bliss Company. Petition on Appeal. Melville J. France, United States Attorney, Post-Office Building, Brooklyn, New York. Service of a copy of the within petition is admitted this 3d day of March, 1916. O'Brien, Boardman & Platt, solicitors for defendant. United States Circuit Court of Appeals Second Circuit. Filed Mar. 6, 1916. William Parkin, Clerk.

996 United States Circuit Court of Appeals for the Second Judicial Circuit.

UNITED STATES OF AMERICA, Complainant,
against
E. W. BLISS COMPANY, Defendant.

In Equity.

The above named complainant, the United States of America, appellant, makes the following assignment of errors in the above entitled cause in the decree entered herein on the 2nd day of July, 1915.

1. That the Court erred in refusing to hold that the complainant, by virtue of the provisions of the contract between the complainant and the defendant of June 12, 1912, was entitled to restrain the defendant from exhibiting or communicating or selling to others than the complainant the several devices mentioned in the complainant's bill of complaint, designs for which were furnished by the complainant to defendant under the provisions of the contract.

2. That the Court erred in failing to hold that the defendant should be restrained from selling, exhibiting or in any way exploiting the existing type of torpedo to any other person, corporation or government other than complainant, on the ground the same would be in violation of the laws of the United States, and particularly the Act of March 3, 1911.

997 3. That the Court erred in holding that "the court can grant relief in this case, only to prevent a violation of the complainant's contract rights."

4. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant as to the design and construction of the changes made in the type of rudders was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than complainant under the terms of the said Act of March 3, 1911.

5. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the method of starting torpedoes, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

6. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the type of depth engine, was such

knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

998 7. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and construction of the changes in the curved fire gyro, was such knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than the complainant under the terms of the said Act of March 3, 1911.

8. That the Court erred in failing to hold that the knowledge obtained by the defendant from the complainant, as to the design and

998 7. That the Court erred in failing to hold that the knowledge as the defendant had obtained from the complainant, within the meaning and intent of the Act of March 3, 1911, commonly known as the National Defense Act, and was thereby prohibited from communicating it to any person, corporation or government other than complainant under the terms of the said Act of March 3, 1911.

9. That the Court erred in not holding that each and all of the various devices and designs communicated by complainant to the defendant, were devices and designs of which the defendant had such knowledge communicated to it by the complainant herein as would warrant the Court in restraining the defendant from communicating the same or any part thereof to any person, corporation or government other than the complainant in this action.

10. That the Court erred in failing to grant a permanent injunction to the complainant as against the defendant, upon the ground that the communicating of the complete construction and operation of the existing type of torpedo and the demonstrating the operation thereof to any person other than the complainant would be, and is, contrary to the Public Policy of this Nation.

11. That the Court erred in dismissing the bill of complainant as to those portions thereof as related to changes in type of rudders, changes in method of starting torpedoes, changes in the type of depth engine, changes in curved fire gyro and changes in the superheater.

12. That the Court erred in dismissing the portions of the bill of complaint herein which applied to other than the balanced turbine, the device for the double regulation of air, the device disclosed by the naval design of ball bearings for the gyroscope, and the device disclosed by the naval design of the inside superheater, as not being in violation of the National Defense Act hereinbefore specifically set forth.

13. That the Court erred in dismissing the portions of the bill

of complaint herein which applied to other than the balanced turbine, the device for the double regulation of air, the device disclosed by the naval design of ball bearings for the gyroscope, and the device disclosed by the naval design of the inside superheater for the reason that the same is against the Public Policy of this Nation.

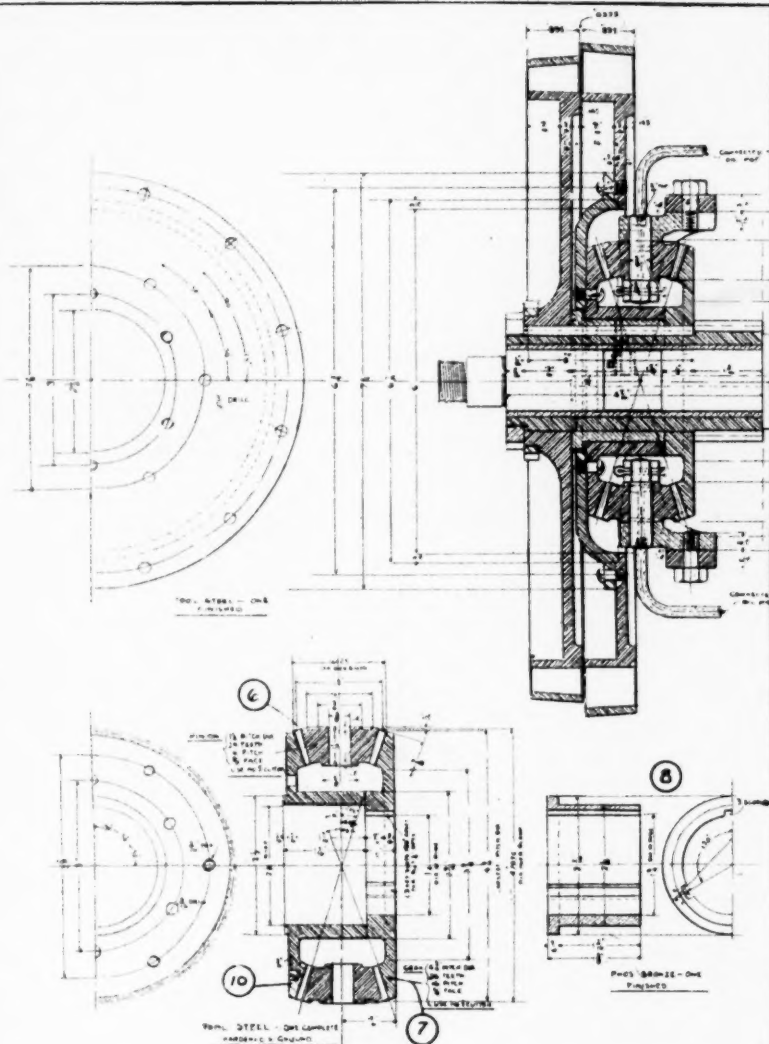
Dated, March 3, 1916.

MELVILLE J. FRANCE,
United States Attorney,
Federal Building, Brooklyn, New York.

1000 (Endorsed:) United States Circuit Court of Appeals for the Second Judicial Circuit. United States of America, Complainant, against E. W. Bliss Company, Defendant. Assignment of Errors. Melville J. France, United States Attorney, Federal Building, Brooklyn, New York. Service of a copy of the within assignment of errors is admitted this 3d day of March, 1916. O'Brien, Boardman & Platt, solicitors for defendant. United States Circuit Court of Appeals, Second Circuit. Filed Mar. 6, 1916. William Parkin, Clerk.

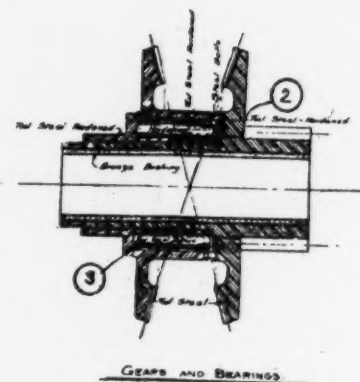
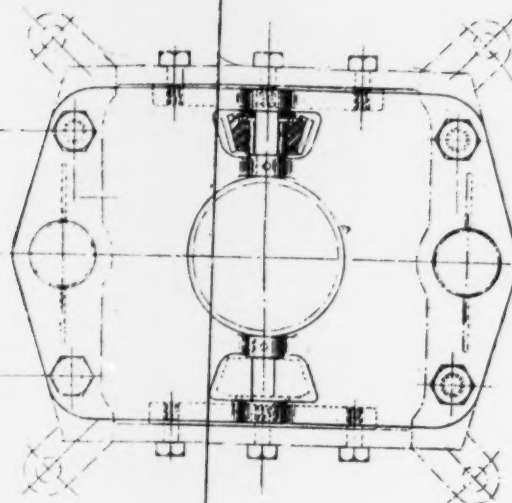
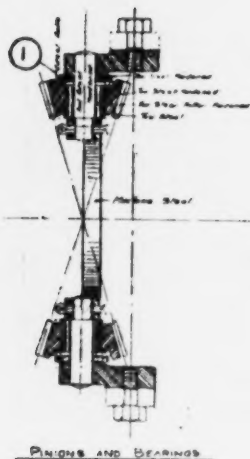
(Here follow diagrams marked pages 1001 to 1016.)

COMPLAINANT'S



[illegible]

403
Blended } 1001
W



403
Buslar } 1002
v. 15

TORPEDO STATION	
NUMBER	208
DRAWER	2
FOLIO	1

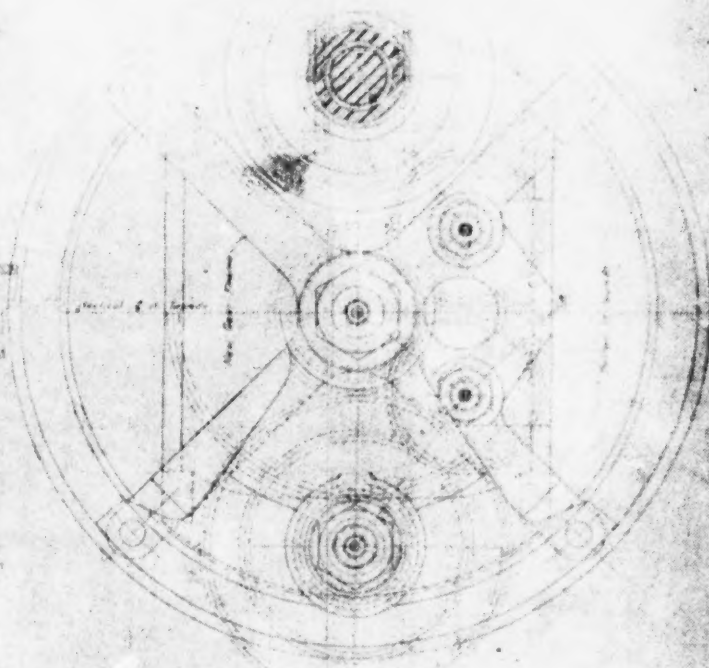
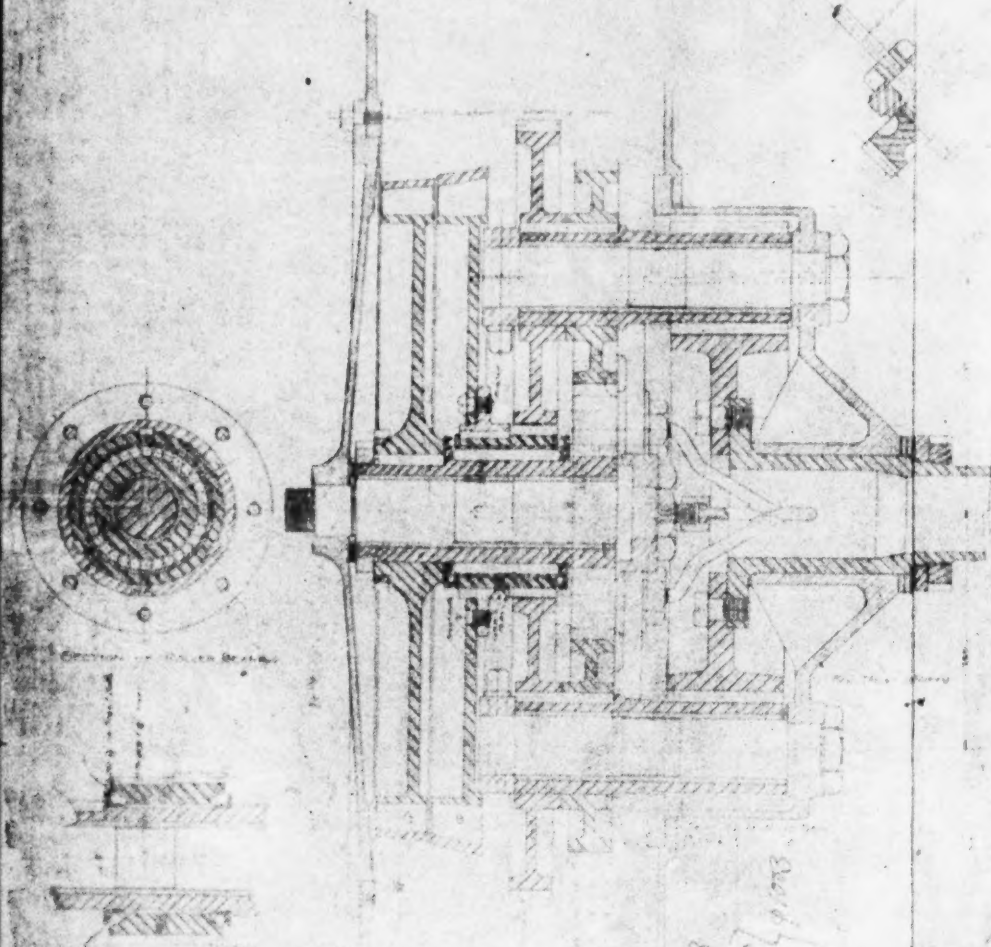
FOR OTHER Dep

No 78
52

88 3/4 x 1/2

DATE	<i>10/18</i>	TORPEDOES
DIRECTION		BLISS-LEAVITT.
WINDSPEED	<i>Ene 10 kts</i>	5 M = 45%, MINIMUM SET
		CHARGE IN BEARING STATION
		<i>DOWN AT 7:15 PM ON 9</i>
		TORPEDO SIGHTED
		SCALE: FULL SIZE
		APPROX <i>[Signature]</i>
		14600000 - Engr.
		TOR STANG E O.

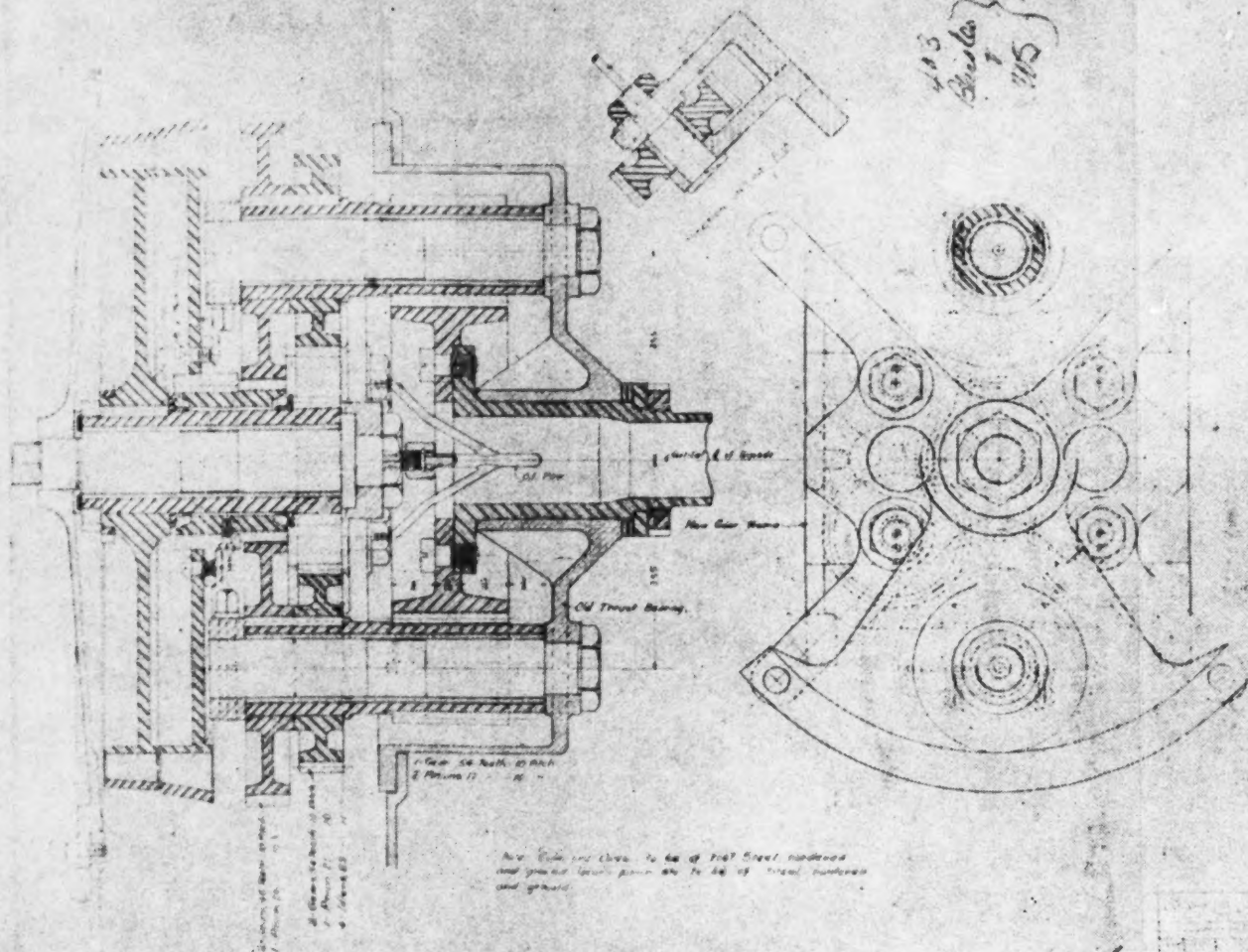
COMPLAINANT'S EXHIBIT 46



403
 200-107
 9/10/13
 1915

TORPEDO STATION NUMBER DESIGN 7 FOUR

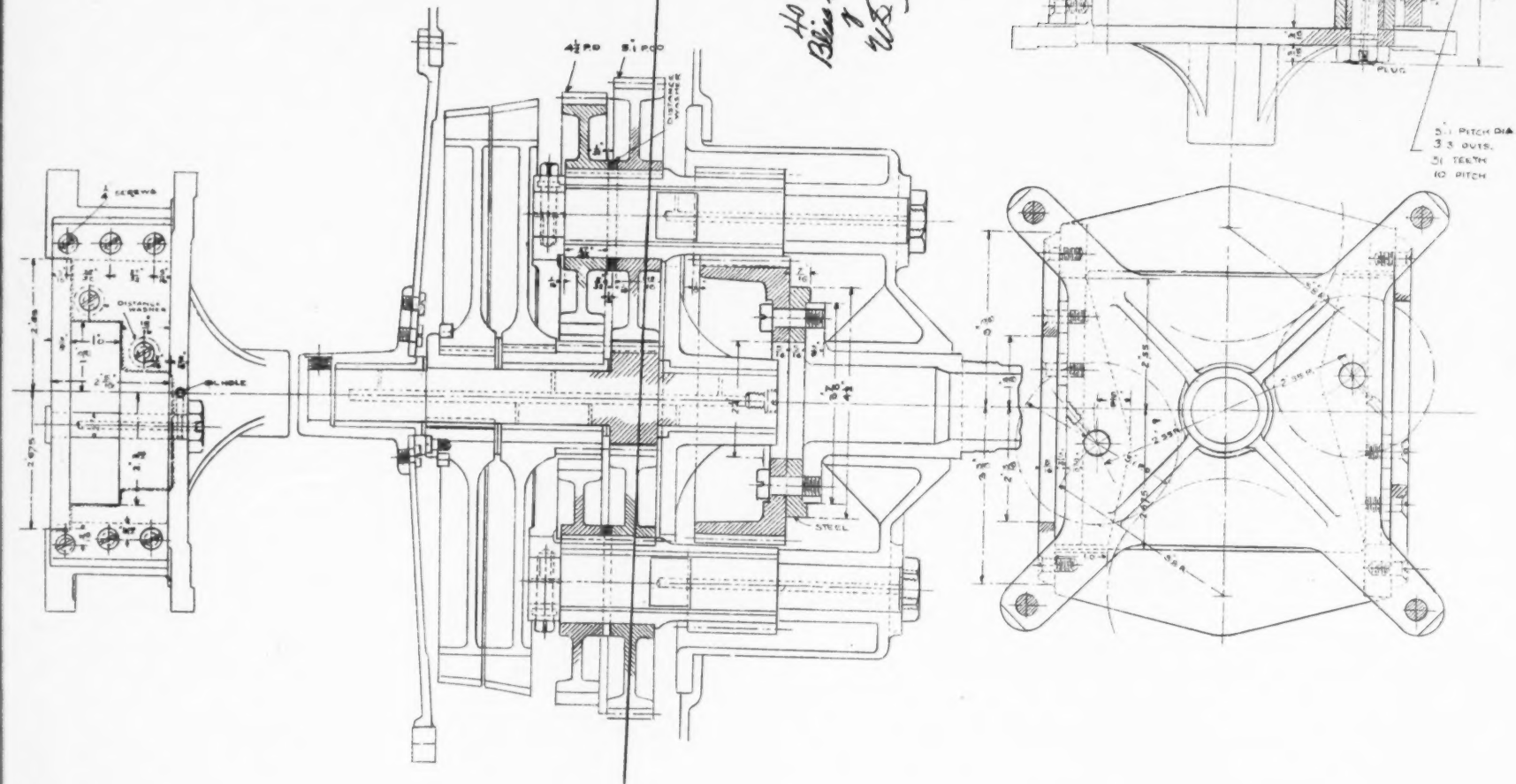
COMPLAINANT'S EXHIBIT 47



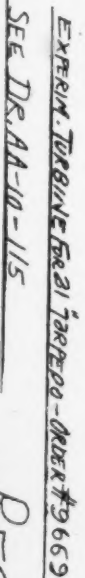
TORPEDO SECTION
NUMBER
DRAWN
FOLIO

January 5, 1907
17561/182-

403
Bliss Las
r 7/10/03
uE

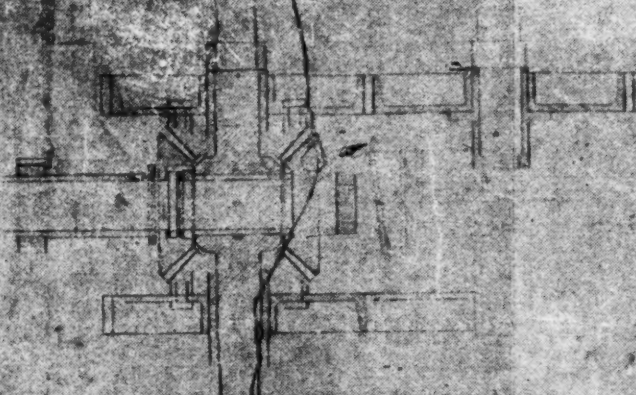


Sept 24 120 ft red dirt
 run 16, 1913
 U.S. Geological Survey, E. D. M.
 Washington, D. C.
 by Charles Schuchert, 120 ft. in
 1899



RECORD

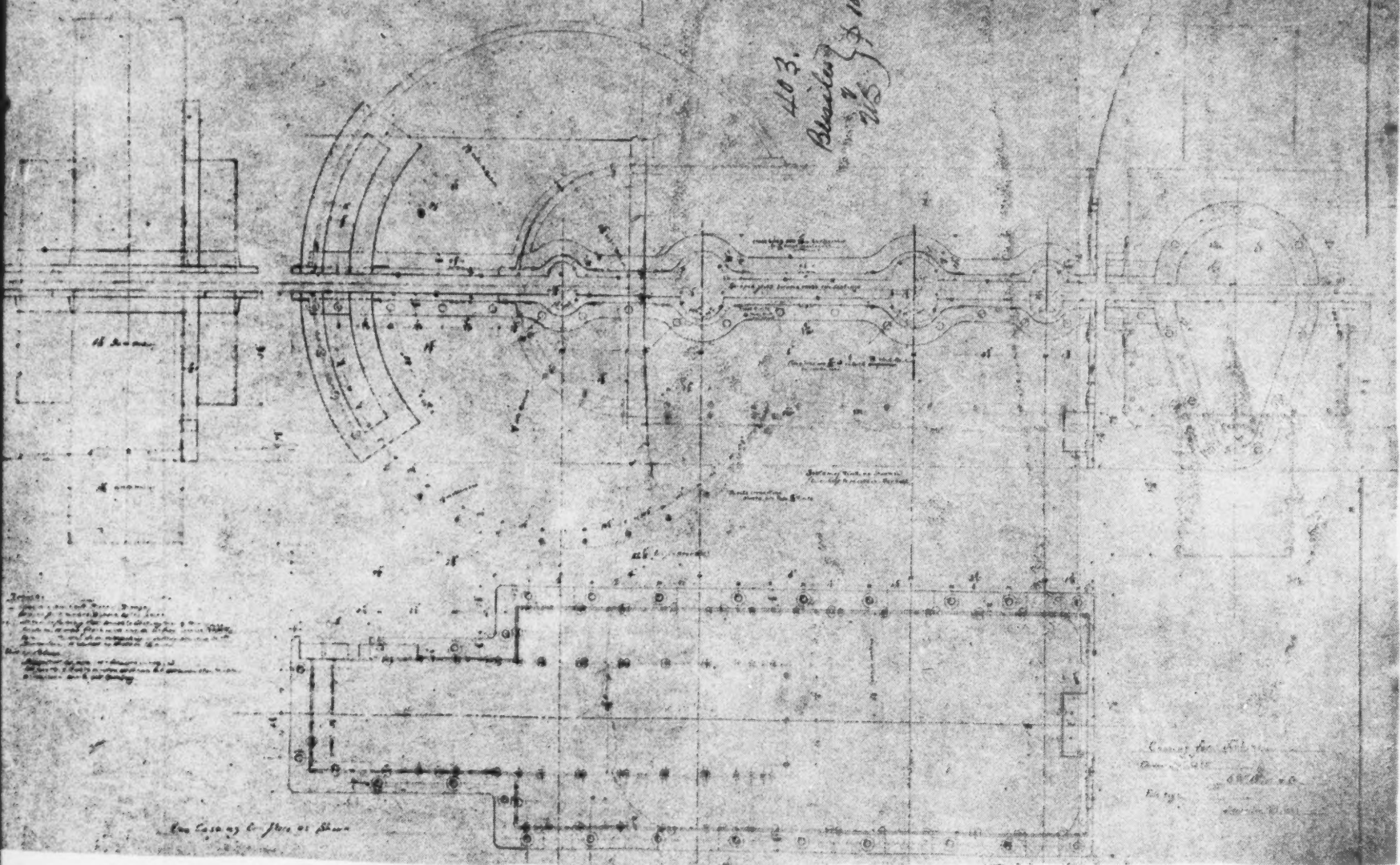
DEFENDANT'S EXHIBIT 122



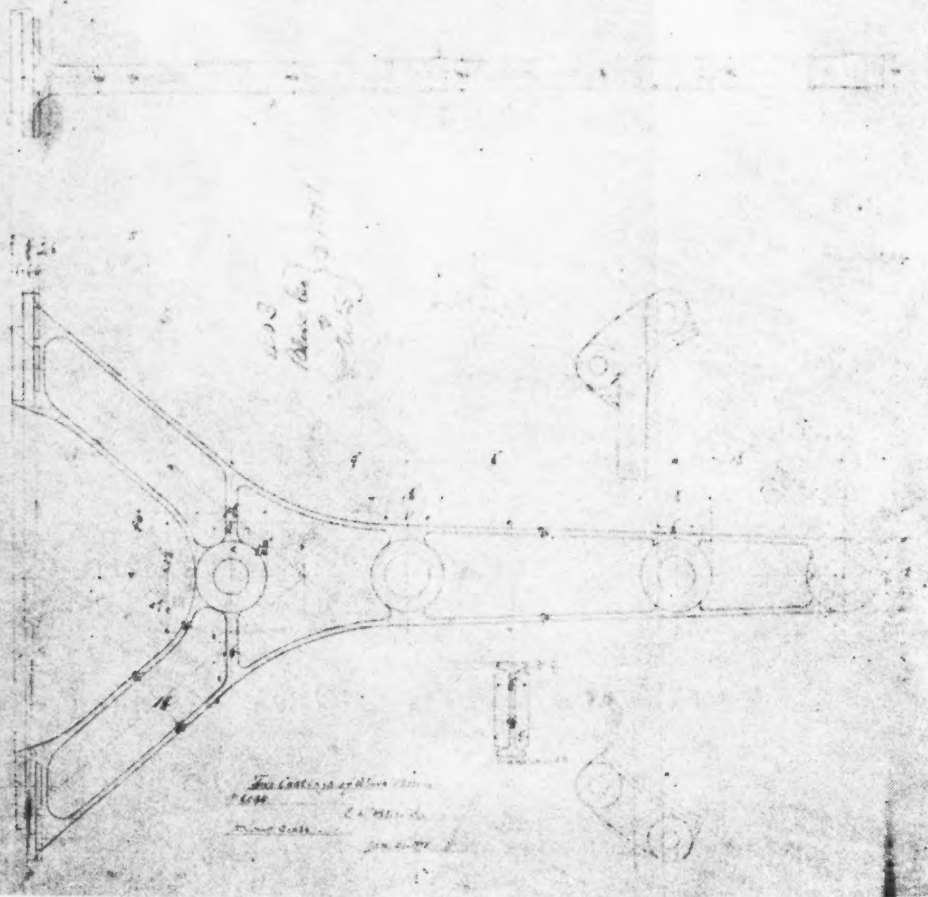
403
Blindfolded
US

DEFENDANT'S EXHIBIT 123

403.
Building
W.S. \$100.



DEFENDANT'S EXHIBIT 124

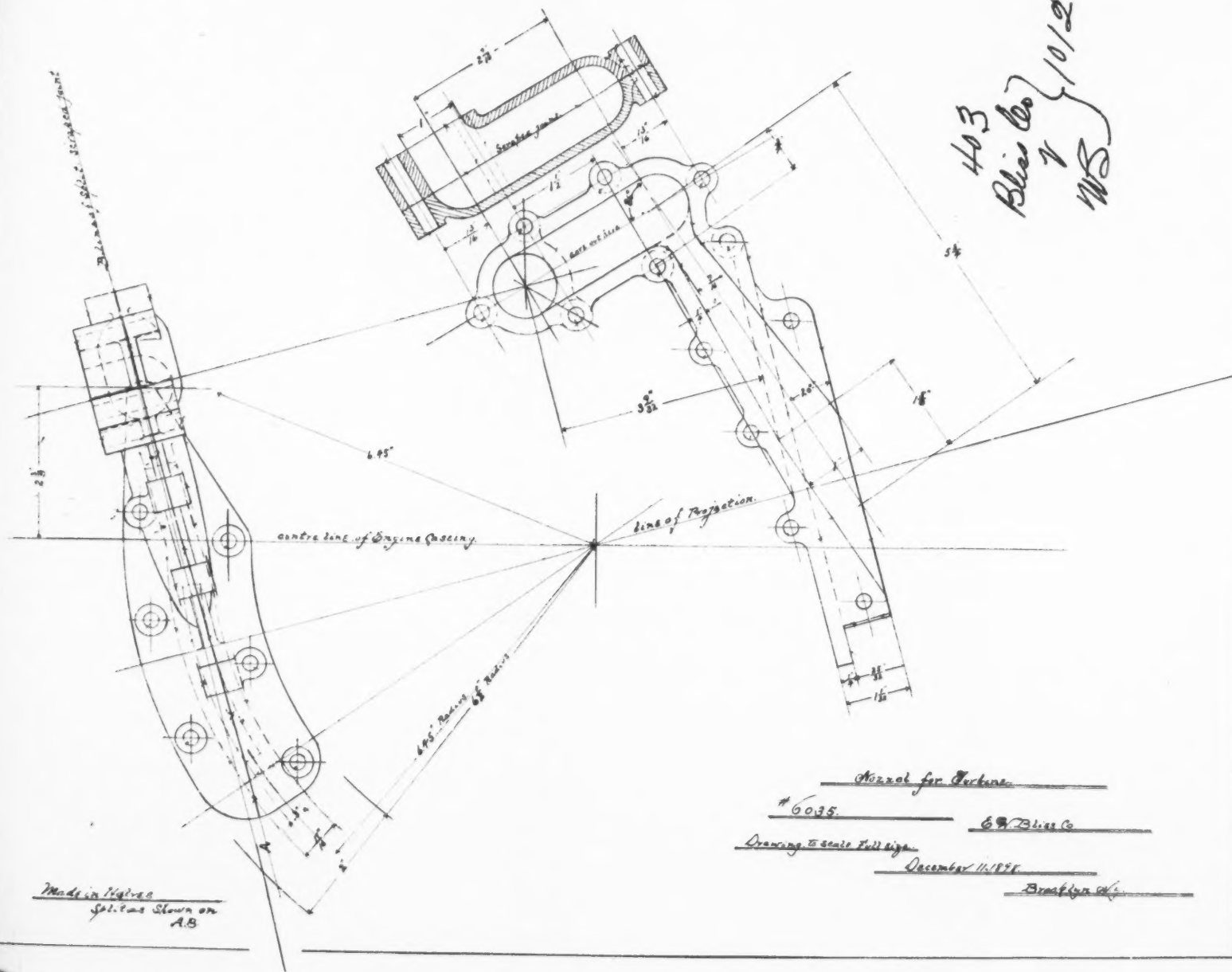


203
Blair Co
2-5-71

The following is a list of the
items of the
property of the
State of California

DEFENDANT'S EXHIBIT 125

403
Bliss Co }
V } 10/2
MS }

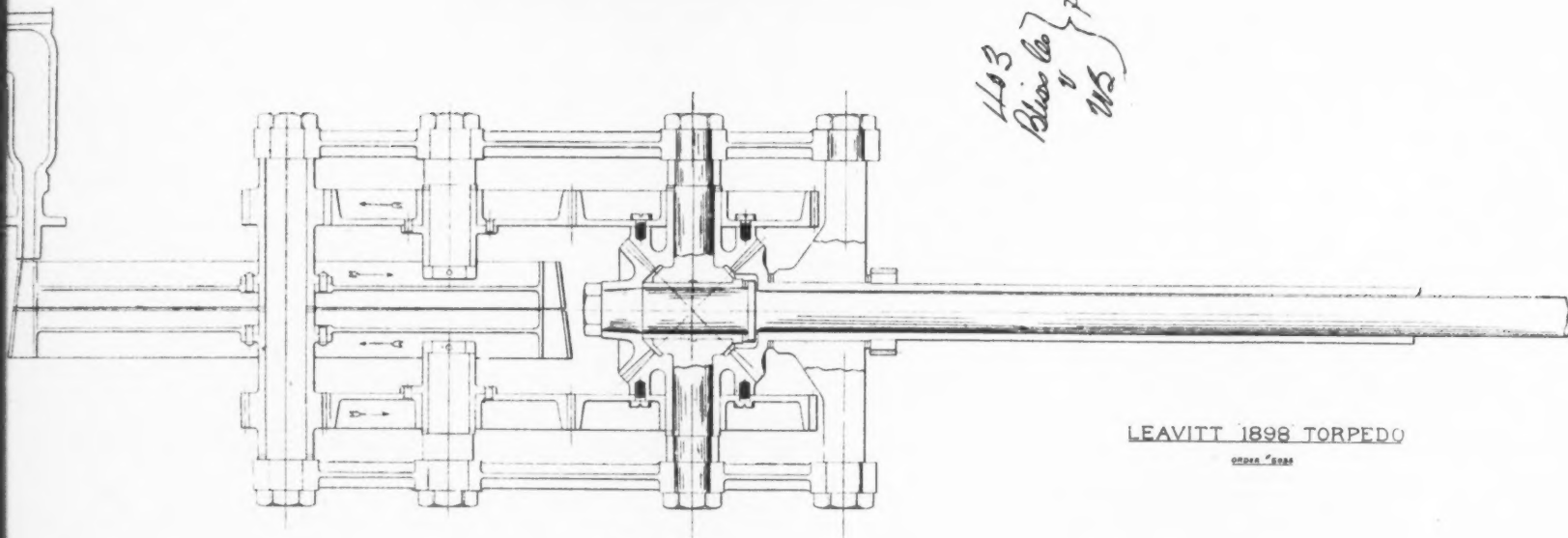


Made in Helms
Sp. was shown on
A.B.

Account for Purchase
6035. 69 Blue G
Drawing to scale full size
December 11, 1895
Breakfast etc.

DEFENDANT'S EXHIBIT 126

403
Bliss Co } p1073
v
WS

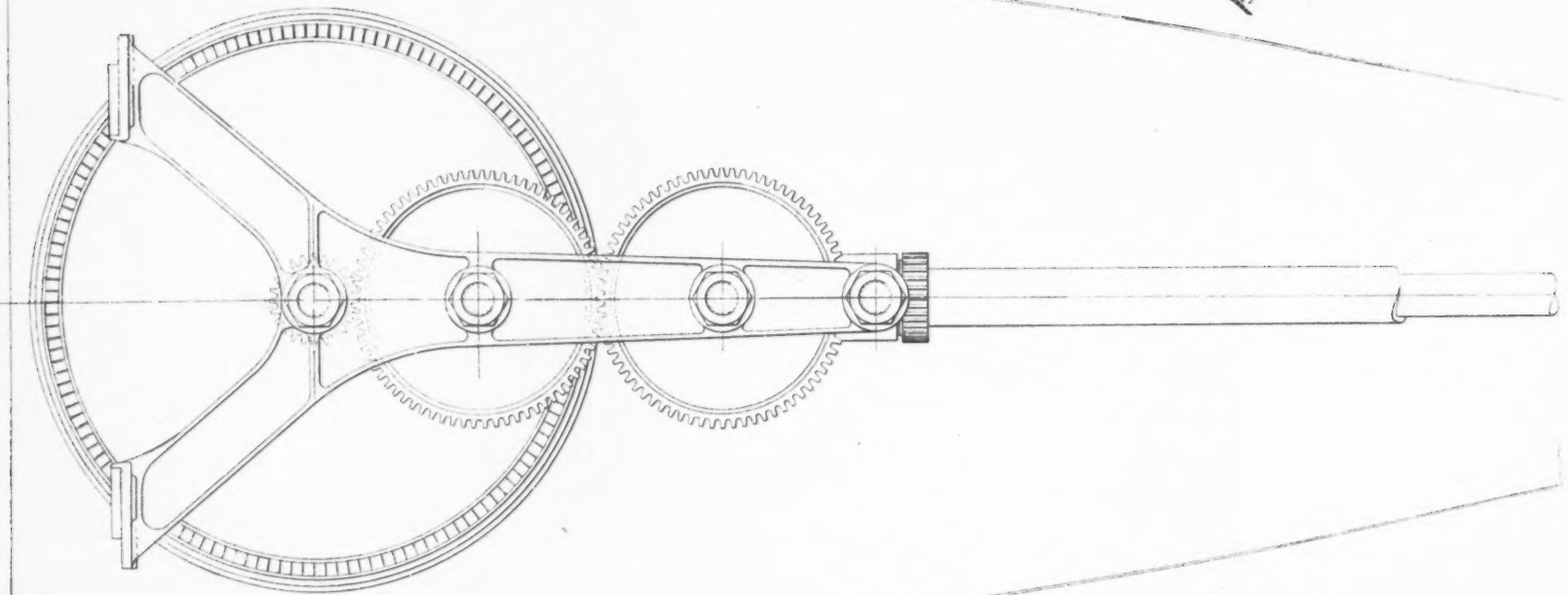


LEAVITT 1898 TORPEDO

ORDER "8000"

DEFENDANT'S EXHIBIT 127

403
Blair Co } 10/14
185.

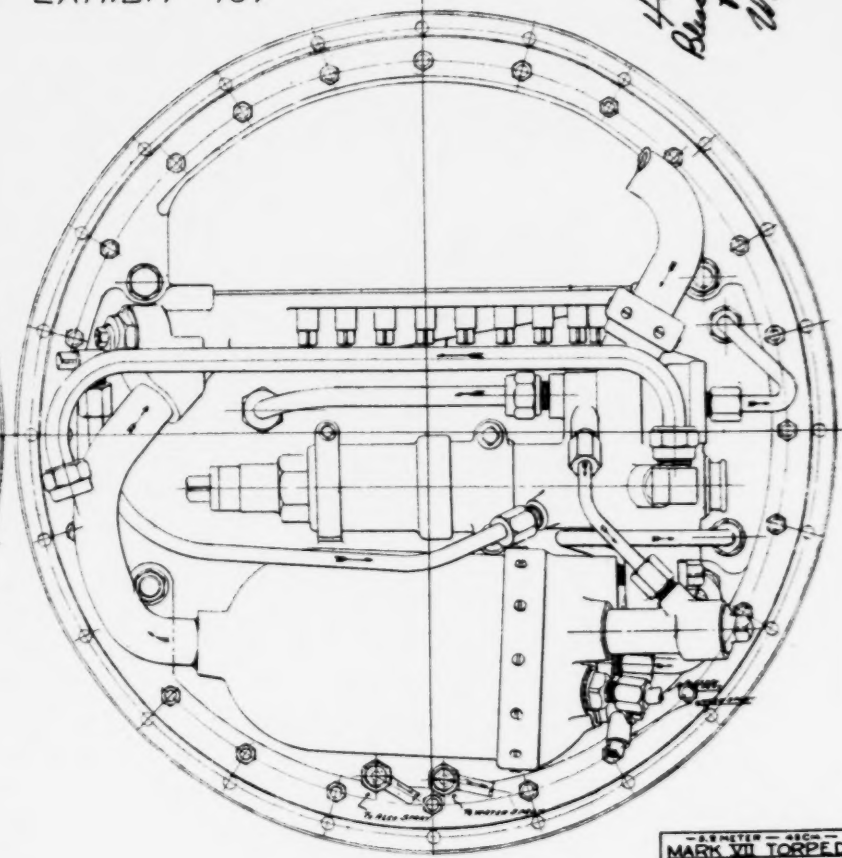
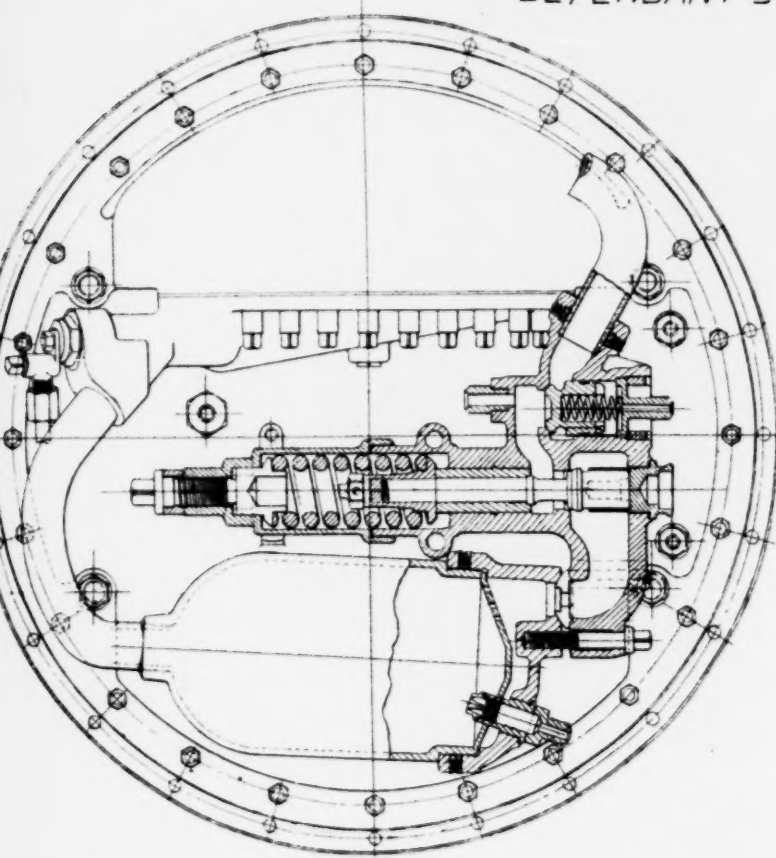


LEAVITT 1898 TORPEDO

ORDER 1898

DEFENDANT'S EXHIBIT 137

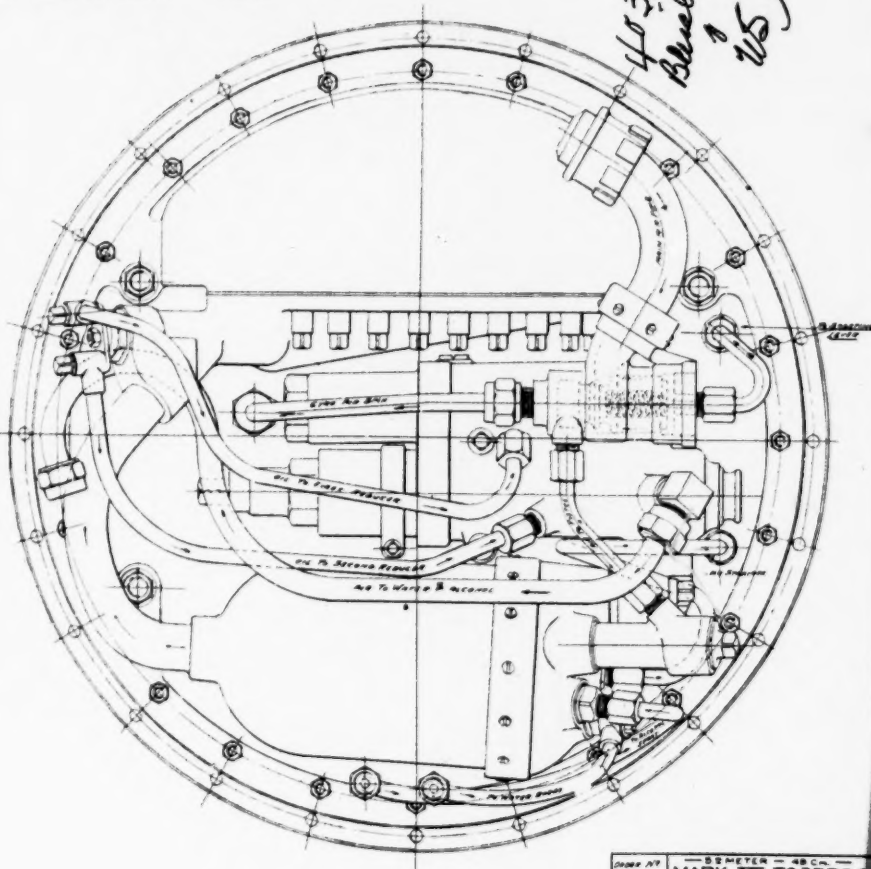
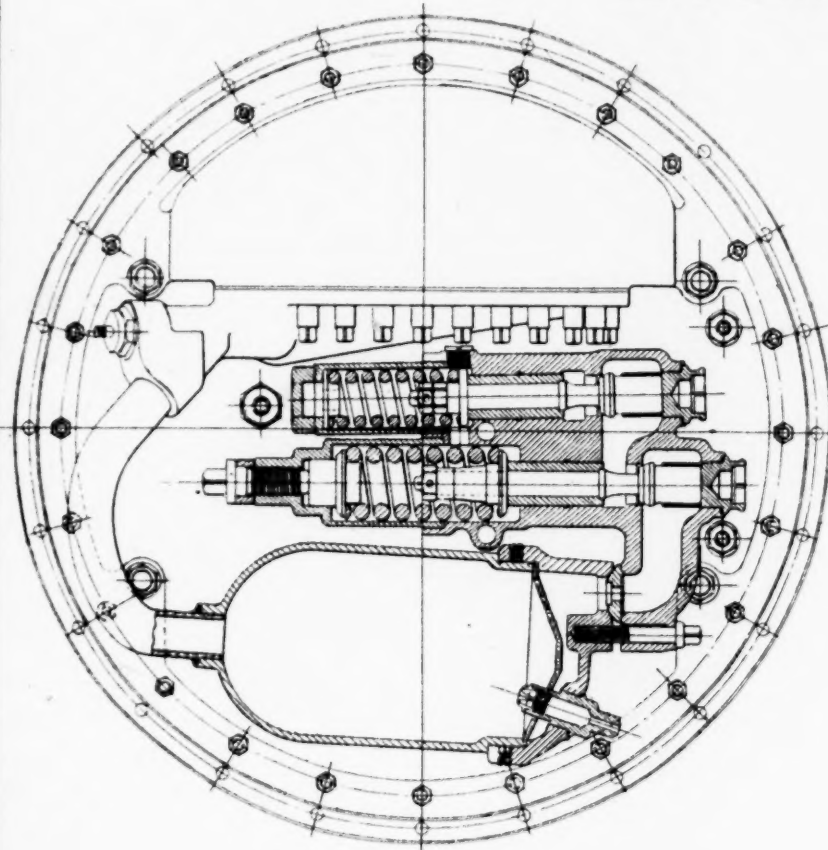
403
Blacks
P1076
WS.



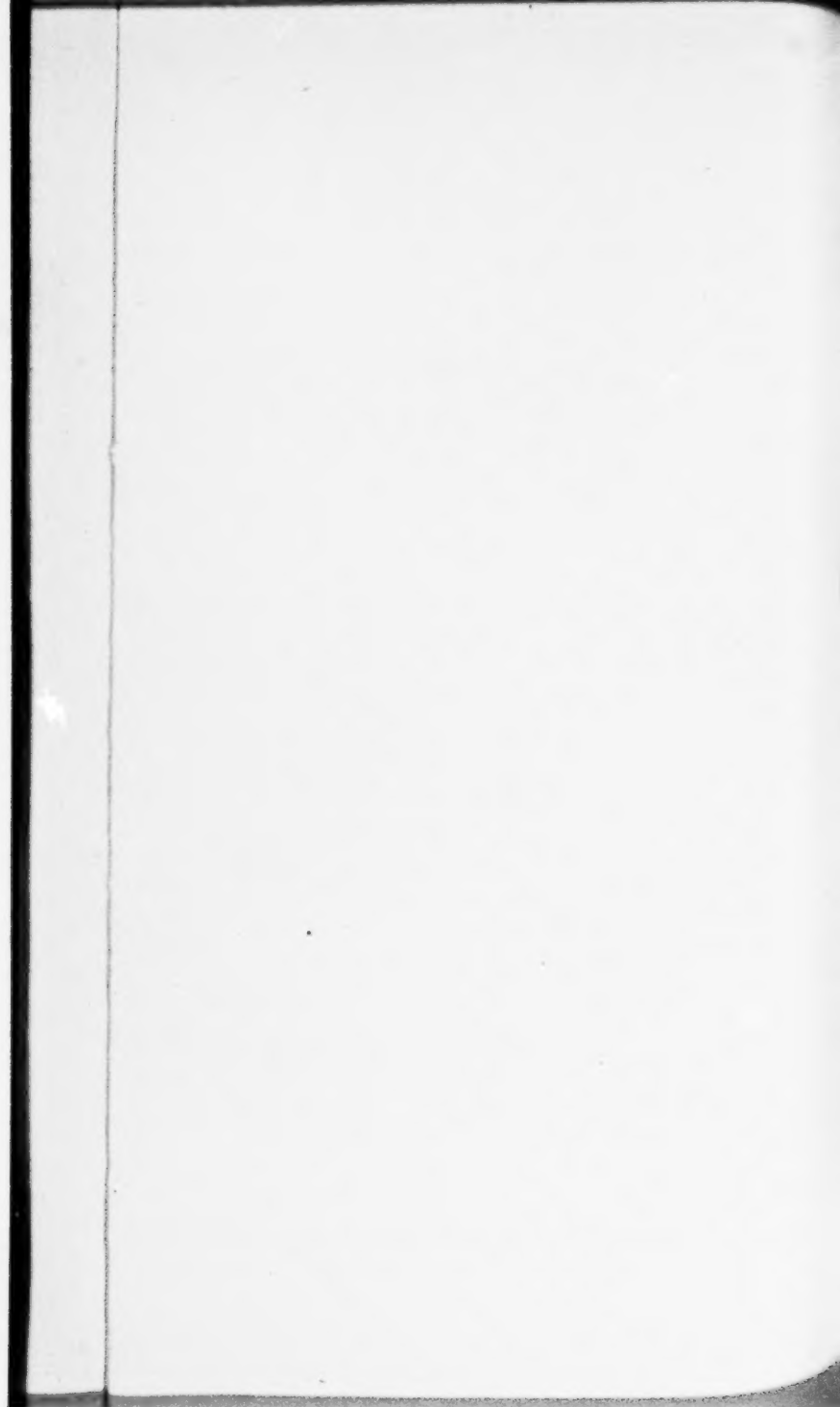
— 5.8 METER — 450 —
MARK VII TORPEDO
— BLISS-LEVITT —
VALVE GROUP
Bliss-Levitt Co.
18-65

DEFENDANT'S EXHIBIT 138

403
Buckley } 1016
US



50 METER - 40 CM.
MARK VII TORPEDO
VALVE GROUP
E. W. BULLOCK
DESIGNED BY
J. W. BULLOCK
18-7



1017 UNITED STATES OF AMERICA,
Southern District of New York:

I, William Parkin, Clerk of the United States Circuit Court of Appeals for the Second Circuit, do hereby Certify that the foregoing pages, numbered from 1 to 578 (Vol. I) and 471 to 908 (Vol. II) inclusive, contain a true and complete transcript of the record and proceedings had in said Court, in the case of

UNITED STATES
 against
 E. W. BLISS COMPANY,

as the same remain of record and on file in my office.

In Testimony Whereof, I have caused the seal of the said Court to be hereunto affixed, at the City of New York, in the Southern District of New York, in the Second Circuit, this 7th day of March in the year of our Lord One Thousand Nine Hundred and Sixteen and of the Independence of the said United States the One Hundred and Fortieth.

[Seal United States Circuit Court of Appeals, Second Circuit.]

WM. PARKIN, *Clerk.*

[United States internal revenue documentary stamp, series of 1914, ten cents, canceled 3/7/16. Wm. P.]

1018 Citation.

By the Honorable Alfred C. Coxe, One of the Judges of the United States Circuit Court of Appeals for the Second Circuit to the United States of America, Greeting:

You are hereby cited and admonished to be and appear before the United States Supreme Court, to be holden at the City of Washington, in the District of Columbia, on the 27th day of February, 1916, pursuant to an appeal filed in the Clerk's office of the United States Circuit Court of Appeals for the Second Circuit, wherein E. W. Bliss Company, Defendant, is Appellant, and you are complainant and appellee, to show cause, if any there be, why the decrees in said appeal mentioned should not be corrected and speedy justice should not be done in that behalf.

Given under my hand at the Borough of Manhattan, in the City of New York, in the Circuit above named, this 28th day of January, in the year of our Lord One thousand Nine Hundred and Sixteen, and of the Independence of the United States of America the One Hundred and Fortieth.

ALFRED C. COXE,
*Judge of the United States Circuit Court
 of Appeals for the Second Circuit.*

1019 [Endorsed:] J-182. U. S. Circuit Court of Appeals.
 Second Circuit. In Equity. United States of America vs.

E. W. Bliss Company. Citation. Arthur C. Fraser, Solicitor for Defendant, 17 Broadway, (Manhattan), New York, N. Y. Du service of a copy of the within citation is hereby admitted this 2 Jan., 1916. Melville J. France, U. S. Att'y, Solicitor for United States Circuit Court of Appeals, Second Circuit. Filed Jan 28, 1916. William Parkin, Clerk.

1020 UNITED STATES OF AMERICA, ss:

By the Honorable Alfred C. Coxe, one of the Justices of the United States Circuit Court of Appeals for the Second Judicial Circuit to E. W. Bliss Company, Greeting:

You are hereby cited and admonished to be and appear at the Supreme Court of the United States, to be holden at Washington on the 29th day of March, 1916, pursuant to an appeal filed in the Clerk's Office of the United States Circuit Court of Appeals for the Second Judicial Circuit, wherein United States of America is appellant and E. W. Bliss Company is respondent, and show cause, if any there be, why the decree in said petition mentioned should not be corrected and speedy justice not be done in that behalf.

Witness the Honorable Edward Douglass White, Chief Justice of the United States, this 3rd day of March, in the year of our Lord, One Thousand Nine Hundred and Sixteen.

ALFRED C. COXE,

United States Circuit Judge.

1021 [Endorsed:] United States Circuit Court of Appeals for the Second Judicial Circuit. United States of America, against E. W. Bliss Company. Citation on Appeal. Melville J. France, United States Attorney, Post-Office Building, Brooklyn, New York. Service of a copy of the within citation on appeal is admitted this 3rd day of March, 1916. O'Brien, Boardman & Platt, Solicitors for Defendant. United States Circuit Court of Appeals, Second Circuit. Filed Mar. 6, 1916. William Parkin, Clerk.

1022 At a stated term of the United States Circuit Court of Appeals for the Second Circuit, held at the court rooms in the Post Office Building, City of New York, on the 23rd day of February, 1916.

Present:

Hon. Alfred C. Coxe, Hon. Henry G. Ward, Hon. Henry Wade Rogers, Circuit Judges.

THE UNITED STATES, Complainant-Appellant,

v.

E. W. BLISS COMPANY, Defendant-Appellant.

Upon application of counsel for the defendant appellant, it is hereby

Ordered that the return day of the citation herein on the appeal

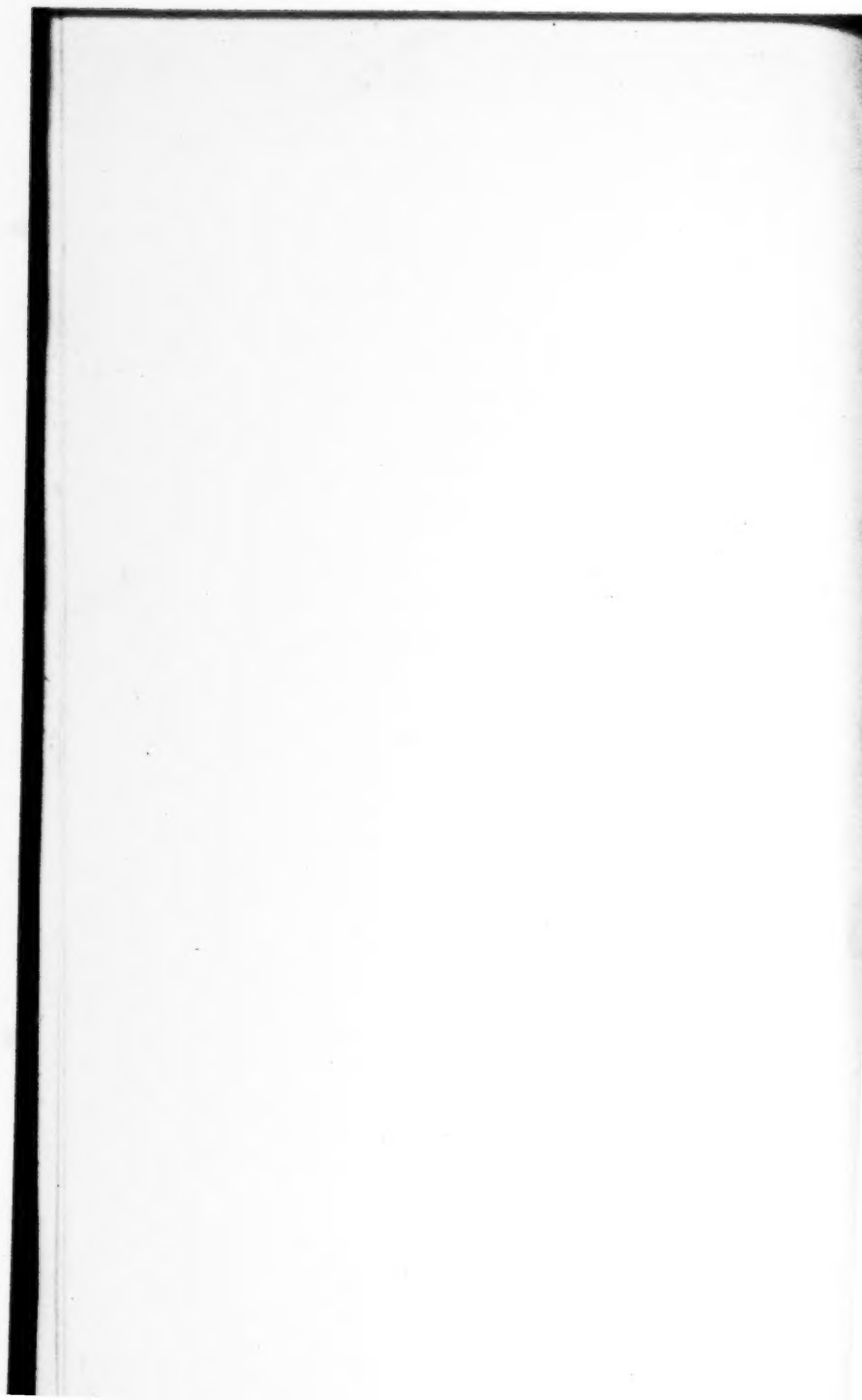
to the Supreme Court of the United States be and the same is hereby extended fifteen (15) days from the date hereof.

Dated, New York, February 23rd, 1916.

ALFRED C. COXE,
United States Circuit Judge."

1023 [Endorsed:] J-182. United States Circuit Court of Appeals, Second Circuit. U. S. v. E. W. Bliss Co. Order. United States Circuit Court of Appeals. Second Circuit. Filed Feb. 23, 1916. William Parkin, Clerk.

Endorsed on cover: File No. 25,169. U. S. Circuit Court Appeals, 2d Circuit. Term No. 403. E. W. Bliss Company, appellant, vs. The United States. File No. 25,170. Term No. 404. The United States, appellant vs. E. W. Bliss Company. Filed March 9th, 1916. File Nos. 25,169 and 25,170.



SUPREME COURT OF THE UNITED STATES

INDUSTRIAL TRADE MARK

Nov. 19, 1906

E. W. BLISS COMPANY

Appellant

vs.

UNITED STATES

Respondent

UNITED STATES

vs.

Appellant

E. W. BLISS COMPANY

Respondent

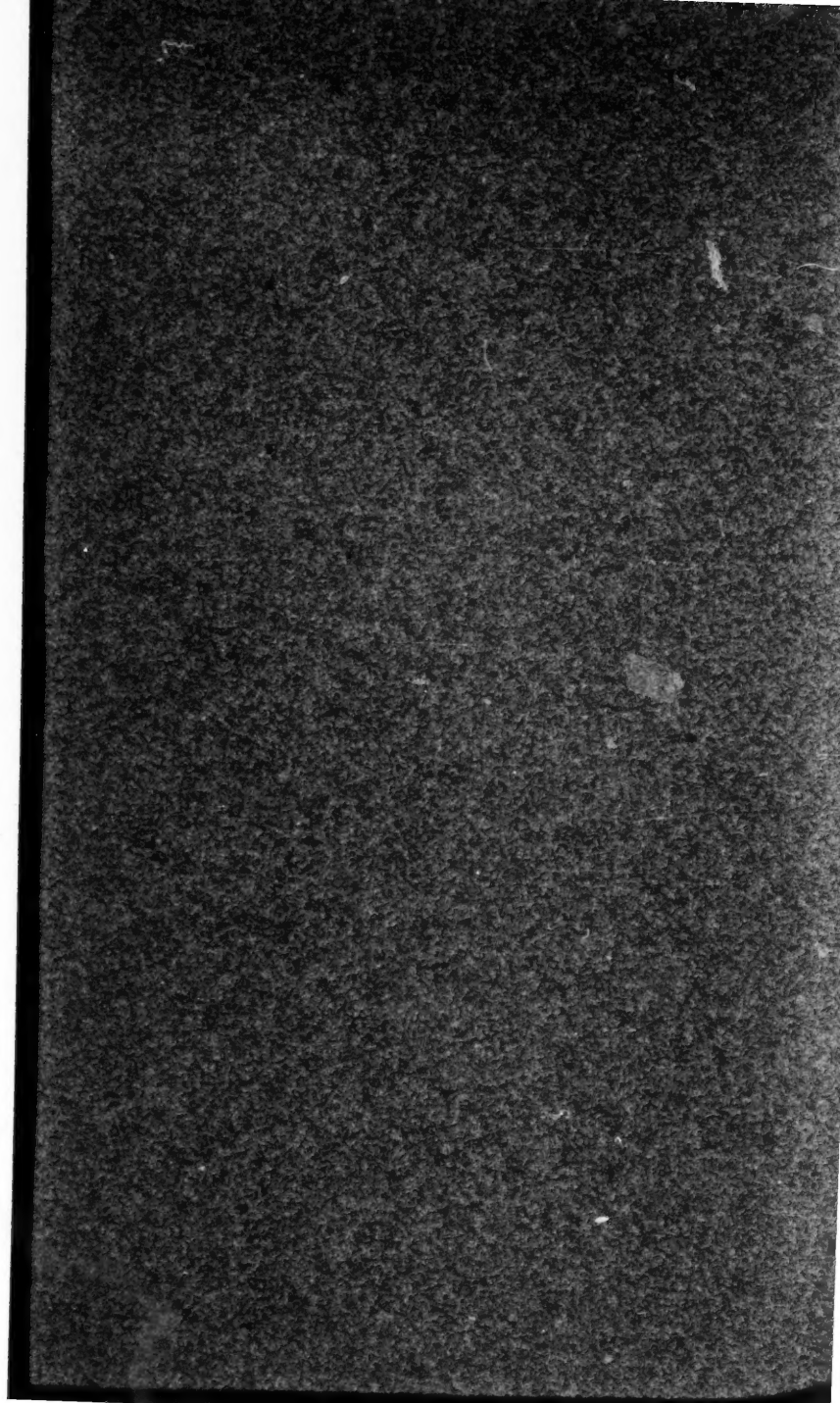
BRIEF FOR APPELLANT E. W. BLISS COMPANY

PLATT & FIELD

Attorneys for Appellant

FRANK H. PLATT
BLISS BLAIR

Of Counsel



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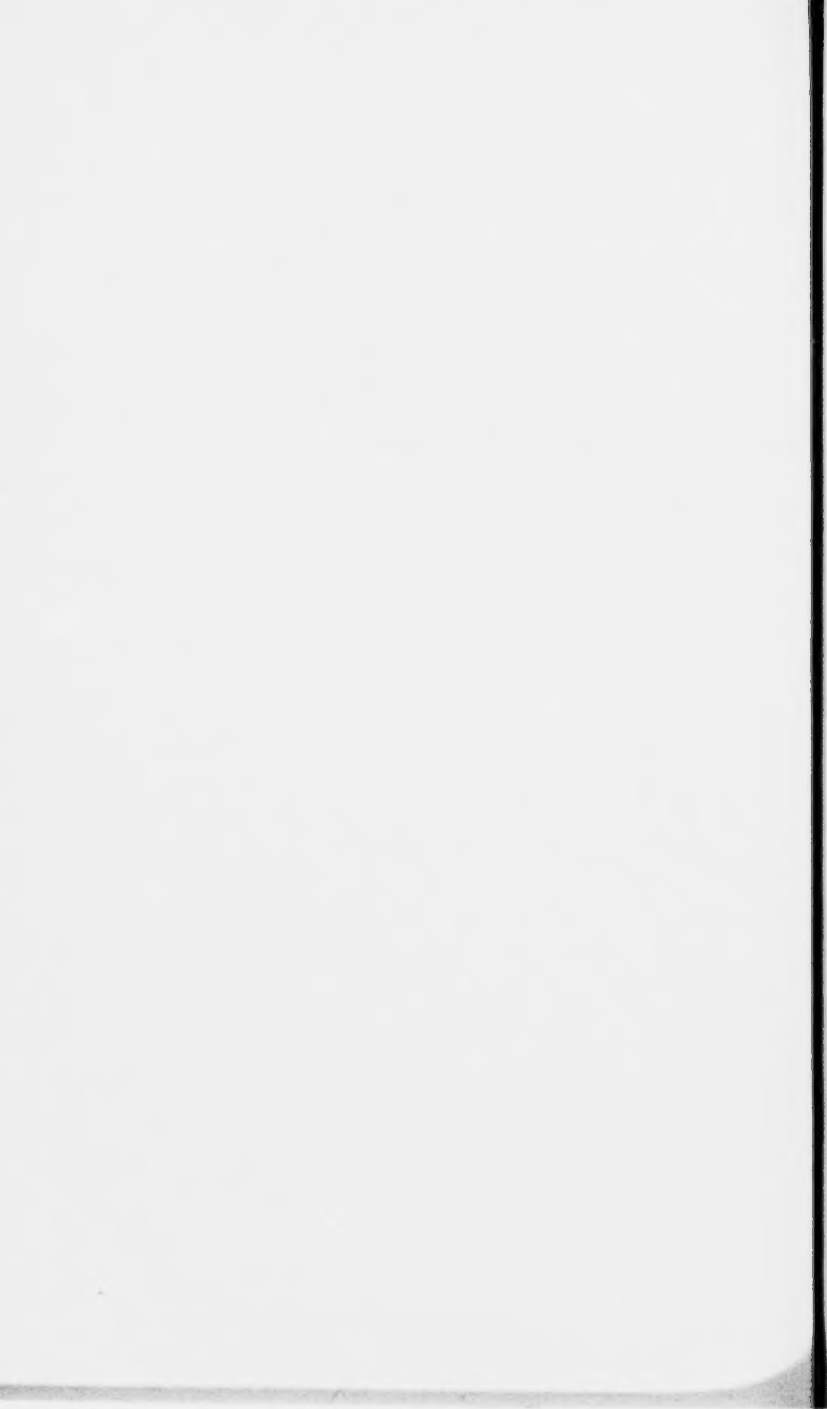
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Supreme Court of the United States,

OCTOBER TERM, 1918.

E. W. BLISS COMPANY,
Appellant,

AGAINST

UNITED STATES,
Respondent.

Nos. 15 and 16.

UNITED STATES,
Appellant,

AGAINST

E. W. BLISS COMPANY,
Respondent.

BRIEF FOR APPELLANT, E. W. BLISS COMPANY.

Cross-appeals are here taken. The appeal of E. W. Bliss Co., the defendant below, is from so much of the decrees of the United States Circuit Court of Appeals for the Second Circuit, dated July 2, 1915, and December 27, 1915, modifying the decree of the United States District Court for the Eastern District of New York, by enjoining the defendant E. W. Bliss Co. from making use in any

torpedo constructed for any one but the United States Government of certain specified devices. The appeal taken by the United States, the complainant below, is from so much of the same decrees as dismisses the complainant's claims that other enumerated devices are the property of the complainant and declines to enjoin the defendant E. W. Bliss Co. from their use (pp. 586-587, 591, 595, 596-598). The complainant, the United States, does not press the contentions raised by its cross-appeal, and hence it must be deemed to have abandoned them. This brief, therefore, will be confined solely to the matters upon which the defendant E. W. Bliss Co. is appellant. Reference, therefore, will be made throughout to the defendant as the appellant and the complainant, the United States, as the appellee.

The action brought by the United States Government on May 28, 1913, is to restrain the alleged breach on the part of the defendant E. W. Bliss Company of contracts made by the parties to this action. The contracts governed the manufacture of torpedoes by the defendant for the use of the complainant.

PLEADINGS.

Complaint.

The complaint alleges a written contract made on November 22, 1905, between the United States and E. W. Bliss Company, a West Virginia corporation, having its principal place of business in Brooklyn in the Eastern District of New York. By its compact, the defendant agreed to manufacture in accordance with plans, drawings and specifications approved on October 23, 1905, by the Chief of the Bureau of Ordnance, 300 torpedoes known as the Bliss-Leavitt torpedo 5 meter 21 inch Mark I. The complaint then quotes *verbatim* paragraph 19 of the said contract, the provisions of which form the basis of its claim for injunctive relief. That clause provides (p. 2) :

(1) That the party of the first part (E. W. Bliss Company) will not make use of any device the design for which is furnished to it by the party of the second part (the United States) in any torpedo constructed or to be constructed for any one other than the United States;

(2) That the Bliss Company shall not exhibit such device or describe it or give any information in regard to it to any others than the United States;

(3) That the Bliss Company will not exhibit the performance of any torpedo containing such device to any others than the United States.

The contract then follows by stating the penalties imposed on the defendant in the event of breach of the said provisions, which are not material to

the issues presented in this action. The clause concludes with a proviso that no device or design shall be included within the above inhibited designation unless the United States Government shall state simultaneously with the conveyance of such device or design by written communication of the United States, that the United States Government considers the said device or design so communicated to be embraced within the said clause.

On June 12, 1912, the complaint continues, a further contract of like nature was made between the parties for the manufacture of 101 torpedoes designated Bliss-Leavitt torpedoes 5.2 meter by 45 centimeter Mark VII. The bill then quotes paragraph 2 of the latter contract. This provides that the word "torpedo" includes everything covered by the drawings, plans and specifications. The manufacture of torpedoes shall conform to said drawings, plans and specifications. The plans, drawings and specifications, continues the clause, are not annexed to the contract. The reason is then stated in the bill. They contain information of a confidential character that cannot be made public without detriment to the interests of both the Government and the Bliss Company, the defendant. They are to be treated, continues the clause, as confidential by the parties to this contract. The contract cautiously continues; but, however, it is understood that nothing in this clause shall be construed as depriving the Bliss Company of the right to make such torpedoes for any other party whatsoever, except as limited by clause 20 of the said contract. Clause 20 of the said contract is identically the same as clause 19 of the contract of November 22, 1905 (p. 4).

The efficiency and value of the said torpedoes,

the complaint alleges, is entirely due to the use therein of turbines revolving in opposite directions for the propulsion of the torpedo, *i. e.*, the balanced turbine method of propulsion. This feature of the torpedo, claims the complainant, was conceived by a United States naval officer in the latter part of 1906 and the early part of 1907, of which it alleges that this appellant was informed under the protective clause above quoted. Letters patent of the United States for this feature now owned by the Government by assignment, it is alleged, were issued to Lieutenant G. C. Davison of the United States Navy on June 25, 1907. The complainant claims that it made the drawings and compiled the specifications and plans for the installation of the turbines and employed the defendant to manufacture the necessary materials for installing the turbines in the said torpedoes. The complainant further charges that it devised and designed in the said torpedoes:

- (1) Modifications of the super-heater;
- (2) Changes in the type of the after body;
- (3) Changes in the location and of the area of the vertical rudders;
- (4) Changes in the method of starting torpedoes;
- (5) Changes in the type of depth of engines;
- (6) Changes in the curved fire gyro;
- (7) Changes in the independent spin principle;
- (8) Ball bearings for gyro bearings;
- (9) Compound regulation of air (p. 5).

All the above devices, the Government avers, are parts of the torpedoes described in the contracts alleged.

The bill then states that when conveying the devices and designs above described, the complainant stated in writing that it considered the said devices and designs within the prohibitive clauses.

Notwithstandingly, the defendant, complainant says, intends to make and dispose of said torpedoes to others than the United States Government and thus not only to violate the provisions of the above contracts, but also to wilfully communicate to persons whom the same ought not in the interests of the national defense to be communicated with documents, sketches, models, plans and knowledge, and thereby to violate the contracts and violate the laws of the United States and the rules and regulations of the Navy Department (p. 6).

On May 9, 1913, the bill states, defendant wrote complainant that it intended to communicate the complete construction and operation of the existing type of torpedo and demonstrate its operation to Whitehead & Company of England about June 1, 1913. The threatened acts, the Government complains, were contrary to the contracts in issue and in violation of the laws of the United States, for which it has no adequate remedy at law. Complainant concluding prays to enjoin the threatened acts (p. 7).

Answer.

The defendant, by its answer, admits the making of the contracts and the provisions thereof recited in the bill of complaint. All the torpedoes referred to in the contracts have not been delivered, the answer states. The defendant (1) denies that the efficiency and value of the torpedoes included in the

contract are entirely due to the use of turbines revolving in opposite directions for the propulsion of the torpedo—that is, the balanced turbine method of propulsion; (2) denies that this feature of torpedo construction was conceived by the United States Government or that it was new in 1906 and 1907, and avers that on the contrary it was known to and used by the defendant at and prior to that time; (3) denies notice under the protective clause quoted. The defendant admits the issuance of the patent to Lieutenant Davison as stated in the complaint and the ownership by the Government of the said letters patent as alleged in the bill. The defendant denies, however, that the complainant made the drawings and specifications for the torpedoes in issue, and avers that it made them. The defendant admits that complainant employed it to manufacture the necessary materials for installing the turbine. The defendant denies that the complainant devised the balanced turbine with turbines revolving in opposite directions, and avers that defendant designed the turbines used in the contract torpedoes.

A modification of the super-heater was devised by the complainant, but is not used in the existing torpedo, the defendant states, and the defendant has not threatened or intended to disclose any information covering the same. The defendant denies the allegations concerning the other designs referred to in the bill. The defendant denies that any notice was given it under the above mentioned clauses regarding the devices enumerated. The defendant admits that it intends to sell to others torpedoes made under the contract of June 12, 1912, and claims a legal right so to do (pp. 8-11).

The answer continuing states that the balancing of rotary bodies analogous to turbines rotating in

opposite directions and of equal speeds for the purpose of eliminating gyroscopic effect was, long prior to 1906, a matter of common knowledge and known to the defendant. The so-called balanced turbine described was known long prior to 1906, and such turbines had been invented and devised by the defendant and had been tested by the defendant. Prior to any communication of the complainant, the defendant had experimented and developed the same and had constructed torpedoes embodying the same. The torpedoes furnished the complainant under its contract with the defendant contained balanced turbines so-called of the defendant's own design, and the property of the defendant (p. 12).

The defendant adds that about August, 1907, the defendant purchased from Lieutenant Davison, with the full knowledge of the complainant, all the rights to foreign patents, and patents are now owned by the defendant for such devices in Great Britain, France and Japan. The defendant, therefore, enjoys the same rights with relation to said invention in those countries that complainant does in this country. The patent is public property in all other countries claims the defendant.

Intermediate the two contracts alleged by the complainant, several other similar contracts were made between the parties for the manufacture of similar torpedoes and continuing the same restrictive clause described by complainant, with full knowledge of the above facts regarding the ownership on the part of the defendant of rights to letters patent of said device in foreign countries, and no notice was given to the defendant by complainant under clause 19 that it claimed the balanced turbine to be within the provision of said clause, and hence it has waived any right to so claim (pp. 11-14).

The Decree Appealed From.

The decree of the District Court enjoined the defendant from making use in any torpedo for others than the United States of what is known as the balanced turbine, either in the form pursuant to Davison's alleged design or in the form used in the existing type of torpedo, and from exhibiting or communicating such torpedo. The complaint was dismissed as to the other devices enumerated in the complaint (p. 274).

The Circuit Court of Appeals modified this decree by striking therefrom the provision dismissing the complaint as to the other devices, and enjoined the defendant from making use in any torpedo constructed for others than the United States Government of the following devices, in addition to the balanced turbine:

(1) Device for double regulation of air, "the design for which was furnished to the defendant by oral description and was referred to in letters respectively bearing date January 4, 1913 and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant".

(2) The device disclosed by the naval design of ball bearings for the gyroscope embodied in Exhibits 52 and 53, furnished to the defendant on March 31, 1906, and referred to in said Bureau's letter to the defendant bearing said last named date and known as Exhibit 51.

(3) The device disclosed by the naval design of the inside super-heater embodied in Exhibits 55, 56 and 57, furnished to the defendant on September 18, 1906, and referred to in said Bureau's letter to the

defendant bearing the last named date and known as Exhibit 54.

The complaint is then dismissed as to the other devices specified in the complaint and not above enjoined. The charges of the complaint that the defendant violated the laws of the United States and the regulations of the Navy Department are dismissed (pp. 573, 574). On reargument the Circuit Court of Appeals declined to disturb the decree as modified (pp. 574, 582-584). From this decree defendant appeals, except as to the dismissal (p. 585).

Facts.

Plaintiff prays an injunction in order that the defendant, E. W. Bliss Company, may not carry out its alleged expressed intention to violate the contracts described in the bill. Complainant seeks particularly to enjoin the defendant from communicating the complete construction and operation of the existing type of Bliss-Leavitt torpedo and from demonstrating its operation to Whitehead & Company or to any others (p. 7).

The E. W. Bliss Company is a corporation having its main works in Brooklyn, New York (p. 123). For many years it has been engaged in the machinery business, making a general line of sheet metal working machinery and special machinery (p. 123). For a period of about twelve years prior to 1903, the appellant E. W. Bliss Company manufactured torpedoes of the kind known as "Whitehead torpedoes" for the United States Government. This torpedo and the patents thereon were owned entirely by Whitehead & Company of England. For convenience and expedition to the United

States Government, they were made in this country by E. W. Bliss Company under a license procured by the Government from Whitehead & Company (p. 123). Some time after this license arrangement between the United States and Whitehead & Company had been in operation, Bliss' chief engineer, Mr. Leavitt, began to make improvements to the torpedo, culminating finally in what is known as the Bliss-Leavitt torpedo (pp. 171-174). The main points of difference between the Whitehead torpedo and the Bliss-Leavitt torpedo are as follows: The Bliss-Leavitt torpedo contains a turbine engine for furnishing the power to drive the torpedo. The Whitehead used a reciprocating engine (p. 123). The Bliss-Leavitt torpedo has a superheating device for heating the compressed air, enabling the torpedo to travel a range six times that of the Whitehead, which used cold air. The Bliss-Leavitt torpedo contains an improved gyroscope which controls the vertical rudders, by means of a device which brought practically no load on the gimbal of the gyro, as against a valve in the Whitehead which was actuated directly from the gimbal (pp. 123, 297, Ex. 132).

Prior to the invention of the Bliss-Leavitt torpedo, the Navy was severely handicapped. Efforts were constantly made to stimulate the defendant and its engineers to improve and simplify the torpedo (pp. 288, 289, 290, 291, 292, 296, 297, Deft.'s Exs. 130, 130 (a), 130 (b), 130 (c), 128, 132, and to provide an American torpedo (p. 292, Ex. 101 at p. 296). As previously stated the Bliss Company finally invented such a torpedo and invited the Naval authorities to witness its tests in the fall of 1903 (pp. 297, 298, Ex. 132). The Torpedo Board of the United States Government, made up of naval

officers, which witnessed the tests of the Bliss-Leavitt torpedo, made a favorable report thereon to the Ordnance Bureau (pp. 298-309, Ex. 133). After this satisfactory demonstration, a contract for making the Bliss-Leavitt torpedo for the Government was proposed. The tentative form of contract suggested by the Government trespassed on appellant's proprietary rights in the torpedo (p. 311, Ex. 24), to which the appellant objected. The Government then agreed to leave the matter open for future discussion (p. 310, Ex. 25).

Up to this time, at least, it will not be disputed that the Bliss-Leavitt torpedo had been wholly invented without Government aid (p. 314, Ex. 21). In 1904 the appellant, while maintaining its proprietary rights in the torpedo and its unqualified right to sell its product to all nations, offered to dispose by sale of the sole control of the Bliss-Leavitt torpedo for a price far less than could be realized by the general sale thereof to the nations of the world (p. 311, Ex. 24). The Government, after careful investigation, declined this offer (p. 312, Ex. 22) assigning as its reason that the sole control of this torpedo had no value, as its features had promiscuous publicity, and it was impracticable to maintain any secrecy with regard to it or its various features (p. 312, Ex. 22). The Whitehead torpedo was then a matter of common knowledge. It was an English design, but maintained a factory at Fiume, Austria, and also in England. One of its most important improvements had been invented by an Austrian, to wit, the Obry gyro (p. 478).

In the fall of 1905, the Navy manifested its intention of co-operating with the Bliss Company in developing the torpedo. While willing to allow the

Bliss Company the use of any improvements its officers might make in torpedoes, the Navy wrote that it desired to reserve such improvements to itself. Any improvements made by the Government were to be omitted from the torpedoes sold to others than the United States Government (p. 314, Ex. 21). The appellant acquiesced in this suggestion, but carefully defined what was to be considered a Government improvement (p. 315, Ex. 20). The limitation on plaintiff's right to dispose of its torpedo was to be confined to "concrete improvements developed by the Bureau" and not to include matters where any possible improvement is suggested by the Government, and worked out by the Bliss Company. A concrete illustration of appellant's position is then set forth as follows: It was pointed out that the Bureau found fault with the starting mechanism of the torpedo and wanted something simpler. If the Bureau, contends the appellant, had suggested the use of a breaking tube, this device would undoubtedly have been its sole property; but as the Bureau merely suggested that a simpler device be substituted and the Bliss Company worked out the manner of its accomplishment, that device was the property of the Bliss Company and was not to be included in the inhibition proposed to be inserted in the contract (pp. 315-316, Ex. 20). The Government apparently agreed to the justice of this claim (p. 316, Ex. 19).

With this elucidation of the position of the parties, the first contract, the alleged breach of which is sought to be enjoined in this action, was entered into. It was made and signed after the exchange of views of the parties above referred to, and on November 22, 1905. The contract provides for the manufacture of 300 torpedoes in accordance

with plans, drawings and specifications previously approved by the Bureau. The torpedoes are designated as 5 meters, 21 inch, Mark I. The torpedo being still in an experimental stage, the contract provides for possible changes in the specifications (pp. 380-381).

The provision upon which plaintiff relies to sustain the decree obtained in this action is inserted at the end of the contract. Insofar as material to this case, it provides: "It is hereby expressly further stipulated, covenanted and agreed that the "party of the first part (Bliss Company) *will not make use of any device the design for which is furnished to it by the party of the second part* " (*italics ours*) in any torpedo constructed or to be "constructed for any person or persons, firms, corporations or others, or for other governments than "the party of the second part (United States Government) hereto; that the party of the first part "(Bliss Company) will not exhibit such device or "in any way describe it to or give any information "in regard to it to any person or persons, firms, corporations or others, or to other governments or "their representatives than the party of the second "part (United States Government); that the party "of the first part (E. W. Bliss Company) will not "exhibit the performance of any torpedo containing "such device either in shop or service tests to any "person or persons, firms, corporations or others, or "to other governments or their representatives "than the party of the second part (United States "Government) hereto". Then follows the penalties to be imposed in case of an infraction of this part of the contract by the Bliss Company. The contract then carefully concludes as previously agreed upon: "Provided furthermore that no de-

"vice or design shall be considered as coming within the provisions of this clause, unless the party of the second part (United States Government) shall state to the party of the first part (Bliss Company) in writing, at the time when the said device or design is itself conveyed to the party of the first part (Bliss Company) by written communication from the party of the second part (United States Government), that the party of the second part (United States Government) consider that the said device or design is embraced within the provisions of this clause" (p. 386).

The following additional contracts were made between the parties for the delivery to the Navy Department of torpedoes on the following dates:

April 20, 1909,
 June 16, 1909,
 October 22, 1909,
 July 27, 1910,
 December 24, 1910 (two contracts),
 February 16, 1911 (two contracts).

Each and all of these contracts contained a clause nineteenth identical with the clause nineteenth in the contract above described.

The last contract made between the parties (up to the time of this litigation), the alleged breach of which is sought to be enjoined here, was made on June 12, 1912. It provided for the manufacture of 120 Bliss-Leavitt torpedoes designated as 5.2 meter by 45 centimetre, Mark VII. Paragraph second of this last contract, in so far as material, provides: "Second. The manufacture of said torpedoes (the word 'torpedoes' as used throughout this contract being intended to include everything covered by the drawings, plans and specifica-

"tions above referred to) shall conform in all respects to and with said drawings, plans and specifications, including duly authorized changes therein, but said drawings, plans and specifications are not hereto annexed or made a part hereof. They contain information of a confidential character that cannot be made public without detriment to the Government's and the contractor's interests, and they are to be treated as confidential by the parties to this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part (E. W. Bliss Company) of the right to make and sell such torpedoes to any other party or government whatsoever except as limited by clause twentieth of this contract" (pp. 388-389).

"Clause twentieth of this contract" is verbatim the same as clause nineteenth of the contract of November 22, 1905.

The first intimation the defendant had that the complainant claimed any interest in the torpedo by virtue of the contracts above referred to was in April, 1911. At that time the appellee wrote the Bliss Company that it had learned that the defendant was negotiating with the Japanese Government for the sale of torpedoes. The Government then called its attention to the alleged fact that it controlled patents for the balanced turbine used in the Bliss-Leavitt torpedoes and that there are other devices used in the Bliss-Leavitt torpedoes which fell under the provisions of clause nineteenth of the later contracts with the Bliss Company (pp. 134, 362, Ex. 14). The defendant promptly denied any rights on the part of the Government to the torpedoes, called attention to clause nineteenth and asked for particulars of the Government's claim

(p. 363, Ex. 13). The Bureau then asserted that it had claimed the protection of clause nineteenth of the contract on January 10, 1907 for a *balanced turbine* patented by Lieutenant-Commander Davison (p. 364, Ex. 12). The Government claimed that on January 10, 1907, it caused to be delivered to the defendant a letter written to the Chief of the Ordnance Bureau at Washington by the Torpedo Station at Newport, together with the endorsement made thereon by the said Chief of the Bureau of Ordnance and a further endorsement made by the Inspector of Ordnance at the Bliss Works (pp. 26-34, 57-63; Ex. 29, p. 334). It further asserted that on September 21, 1906, the Bureau had claimed the protection of clause nineteenth for a *nipple for superheater pot* (p. 364, Ex. 12). The defendant promptly denied the receipt of the first alleged notice and pointed out its claims in relation to the balanced turbine (pp. 365-367, Ex. 11). While this discussion continued (pp. 367-369, Ex. 10), defendant again offered to dispose of all its rights to the Bliss-Leavitt torpedo to the United States Government for a figure far less than their fair value (p. 369, Ex. 9; p. 370, Ex. 8). This offer the Government ignored. The defendant then declared its intention of continuing its negotiations with Whitehead & Company of England for a sale of its torpedoes to Whitehead & Company (p. 378, Ex. 5). Thereupon this action was brought.

It will be observed that all discussion before this suit referred solely to the balanced turbine, with one desultory reference to a nipple for a superheater pot, and no claim was ever before made to the various other devices included in the complaint.

The complainant's witness, Commander Williams, defined a *balanced turbine* as consisting of

parts, revolving in opposite directions around a concentric axis, of exactly the same masses, this revolution being produced by any of the various forms of turbine impulse (p. 84). The same witness also described a balanced turbine as consisting of two turbine wheels revolving in opposite directions mounted on concentric axes. The products of combustion flow from the combustion pot (superheater) through small orifices called nozzles, and impinge upon the blading of the first stage turbine, giving up some of its energy and revolving this turbine at a high rate of speed; in passing through what is known as the buckets of the first stage, the direction of the gasses is changed to a greater or less extent in the opposite direction from which they are traveling when they impinge in the first stage turbine, and strike upon the buckets of the second stage turbine revolving that wheel in an opposite direction. The two axes of the turbine wheels are intergeared. Pointing to the torpedo in evidence as a type of the existing torpedo manufactured by the appellant for the appellee, the axes of the turbine wheels are geared with two concentric shafts, one of which turns the forward propeller, the other the after propeller of the torpedo (p. 36).

The device for *double regulation of air*, referred to in the decree, has been defined as the application of a first valve to reduce from the high pressure in the compressed air flask to an intermediate pressure, and then a second valve to reduce from that intermediate pressure to a superheater pressure (pp. 120, 130-132).

The device embodied in Exhibits 52 and 53, referred to in the decree, of *ball bearings for the gyroscope*, is described as a cage or holder which

retains in place three balls and which keeps these balls separated from one another so that they do not rub frictionally against one another. When in use this cage with its three balls is used at each end, or rather each side of the rotating wheel of the gyroscope as shown in Exhibit 52, so that these balls are interposed between the two axes of the rotating gyro wheel and of the surrounding support, thus reducing the friction of the gyro wheel (p. 128).

The device referred to in the decree, as shown in Exhibits 55, 56 and 57, is of an *inside superheater*. The inside superheater is described as having been the first form installed in torpedoes for heating the air. Alcohol was injected in the main body of the air flask itself and ignited at the moment of firing. The temperature of the whole mass of air was raised before proceeding through the piping to the regulator and to the engine. This is described by the plaintiff as what is known as an inside superheater. The distinction between an inside superheater and an outside superheater is that in the inside superheater the combustion was inside the compressed air flask, and in the outside superheater it is exterior to that flask. The so-called outside superheater was a small vessel through which the air passed and was heated by alcohol (p. 84).

These devices will be more minutely described under the respective points in which they are discussed.

Assignment of Errors.

The above named defendant E. W. Bliss Company, Appellant, makes the following assignment of errors in the above entitled cause in the decree entered therein on the second day of July, 1915, and on the twenty-seventh day of December, 1915.

1. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of what is known as the Balanced Turbine in its original form as specified in the Exhibits 28 and 29; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said Balanced Turbine or of any torpedo or torpedoes which shall contain the same.

2. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of what is known as the Balanced Turbine in the form contained in Exhibit 27, being that form now used in the existing type of torpedo; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said Balanced Turbine or of any torpedo or torpedoes which shall contain the same.

3. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes con-

structed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device for the Double Regulation of Air; and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device, or of any torpedo or torpedoes which shall contain the same.

4. That the Court erred in holding that defendant was furnished with a design of a device for the Double Regulation of Air by oral description.

5. That the Court erred in holding that letters dated respectively January 4, 1913, and January 18, 1913, and known as Exhibits 64 and 65, written by the Chief of the Bureau of Ordnance of the Navy Department to the defendant, referred to a design for a device for the Double Regulation of Air furnished to defendant by complainant.

6. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of Ball Bearings for the Gyroscope embodied in Exhibits 52 and 53, furnished to the defendant on March 31, 1906, and referred to in said Bureau's letter to the defendant bearing said last named date and known as Exhibit 51, and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said

last named device or of any torpedo or torpedoes that may contain the same.

- 7. That the Court erred in enjoining defendant from making use, in any torpedo or torpedoes constructed or to be constructed for any person or persons, firm, corporation or others or for other governments than the United States of America, of the device disclosed by the naval design of the Inside Superheater embodied in Exhibits 55, 56 and 57 furnished to the defendant on September 18, 1906, and referred to in said Bureau's letter to the defendant bearing the last named date and known as Exhibit 54, and from communicating or exhibiting to any such parties or governments the construction of, or exhibiting the performance of, said last named device or of any torpedo or torpedoes that may contain the same.

8. That the Court erred in excluding, over the defendant's objection and exception, evidence that no claim was made by the Government, or its officers, that the Balanced Turbine was covered by the 19th clauses of the contracts between the contract of November 22, 1905, and that of June 12, 1912, when the said intervening contracts were negotiated and made.

9. That the Court erred in not holding that at the time the complainant is held to have furnished defendant the design for Balanced Turbine, the device shown in the said design was old and well known and that therefore it was not a device which was included in Clause 19 of the 1905 contract.

10. That the Court erred in not holding that at the time the complainant is held to have furnished

defendant the design for Balanced Turbine, the said design was then in the possession of defendant and had been theretofore used by it, and that therefore it was not a design which was included in clause 19 of the 1905 contract.

11. That the Court erred in not holding that the publication of the design for the Balanced Turbine in the Davison patent No. 858,266, issued June 25, 1907 (being subsequent to the date when a design therefore is held to have been furnished by complainant to defendant), relieved defendant from the restrictive provisions of the contract under which the said design is held to have been furnished defendant, or the contract of June 12, 1912, as to such Balanced Turbine.

12. That the Court erred in not holding that the defendant by acquiring Davison's foreign patents with the knowledge and acquiescence of the complainant, thereby became entitled to manufacture, sell and use in foreign countries, and to disclose, the Balanced Turbine for torpedoes as set forth in said foreign patents, and that thereby the complainant waived any right which the complainant might otherwise have had under the contracts between the parties to restrain the defendant from such foreign manufacture, sale and use, and such disclosure.

13. That the Court erred in not holding that defendant could freely disclose the design for Balanced Turbine as contained in the existing type of torpedo without violation of the complainant's rights.

14. That the Court erred in not holding that defendant could freely disclose the design for the device for the Double Regulation of Air as contained in the existing type of torpedo without violation of the complainant's rights.

15. That the Court erred in not holding that clause 19 in the 1905 contract between complainant and defendant, and clause 20 in the 1912 contract, were limited to devices which originated with or were the exclusive property of the complainant and were by it furnished to defendant.

16. That the Court erred in not dismissing the bill of complaint.

17. That the Court erred in not awarding defendant costs (pp. 591-594).

POINT I.

The cause being under review by appeal, is subject to review upon both law and facts.

City of Cincinnati v. Cincinnati & Hamilton Traction Co., 245 U. S. 446, 454; and cases cited.

POINT II.

The restriction in clause nineteenth (or twentieth) of the contracts applies only to a "device the design for which is furnished by the Government". It expressly and clearly excludes ideas, methods or principles.

At the outset the appellant points out that the Government claims no greater rights than an individual or private corporation because it is exercising governmental functions. Its position and rights under the contracts are no different than that of an individual or private corporation, as is admitted (p. 124). It is well established that when a sovereign state enters into a business contract, it is held to the same contractual obligations and consequences as any private contracting party (39 *Cyc.*, 742). This Court applies to contracts made by the Government, the same construction and effect as to contracts between individuals (*Smoot's Case*, 15 Wall. 36; *United States v. Smith*, 94 U. S. 214; *United States v. Barlow*, 184 U. S. 137).

The principles applied generally in the construction of contracts are applied to one to which the United States is a party (*United States v. Gurney*, 4 Cranch. 333; *Charles River Bridge Case*, 11 Peters 420, 611).

This is, of course, as it should be. It would be striking at the very vitals of our institutions to rule that any inequality should exist between the litigants,—to rule that one class of litigants is entitled

to greater rights than another under a contract mutually entered into.

As previously pointed out, the parties came to a clear understanding of the restriction to be placed on the defendant's original unlimited right to dispose of its torpedo before having entered into contractual relations. The discussion had been prefaced by a clear understanding that the torpedo was the property of the Bliss Company (p. 314, Ex. 21).

On October 16, 1905, the Government wrote the defendant:

"The situation being as above set forth, the Bureau now intends to use the skill and experience of its officers and others, and to expend a certain amount of money in perfecting certain features of the torpedo. While it is desirous of doing this, and of giving you the benefits of its discoveries, should any of value be made, in order that you may use them in filling contracts entered into between you and the United States Government, at the same time it would not be right for you to make use of knowledge thus gained at the expense of the United States and by work of its officers * * *" (p. 314).

The E. W. Bliss Company on October 19, 1905, said in its reply to the Government:

"We believe, however, that the Bureau will agree with us that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the suggestion of a possible improvement is made by the Bureau and worked out by us.

"As this is a very important matter, and as we wish to be very careful not to divulge anything which the Bureau considers its private

property, and to have no misunderstanding as to where the line shall be drawn, we mention the following as an illustration of our position.

"The Bureau found fault with our starting mechanism and wanted something simpler and requiring less attention. If the Bureau had suggested the use of a breaking tube, this device would clearly have been its sole property. But as a matter of fact, although it was the Bureau's suggestion that a simpler device be substituted, as we worked out the manner of its accomplishment, we feel it to be our property.

"We should be pleased to be informed if this view of the case meets with the Bureau's approval" (p. 315).

The Government expressed its intention to assist in perfecting or improving the torpedo. It desired to retain for itself improvements made by its officers. The intention was to limit these confidential matters strictly to concrete improvements developed by the Bureau of Ordnance. The appellant had refused to restrict its right of sale by excluding from the torpedoes the embodiment of any information, device or suggestions or other matters furnished to it by the Government (Ex. 116).

It was clearly understood, therefore, that the restraint was to be only on devices the design for which was furnished by the United States. To furnish a design, it is necessary to furnish something concrete. A device also is something concrete. One cannot exhibit an idea.

A device has been defined as "a thing devised or formed by design, a contrivance, an invention."

Armour Packing Co. v. United States, 209
U. S. 56.

The definition of the term "design" as given in 1821 by Judge Washington in *Binns vs. Woodruff*, 4 Wash. C. C. 48, 3 Fed. Cas. No. 1424, has been accepted as the true definition (see the Law Dictionaries of Bouvier, Black and Rapalje). Judge Washington said:

"The bill states that the 'design' (which phrase, when used as a term of art, clearly means the giving of a visible form to the conception of the mind, or, in other words, to the invention) was from the pencil of Bridport; and it then proceeds to describe more particularly all the parts of that design. This allegation is confirmed by Murray, who states, that the design which he was employed to engrave, was the work of Bridport, and that it embraced the general arrangement of the plaintiff's publication; and the same witness, speaking as an artist, says, that the arrangement, which was drawn by Bridport, constituted the design."

A device is a permanent material thing. The crossing of a belt, for instance, to produce a reversal of motion, is not a device, but merely a method of using a device.

Heap v. Greene, 91 Fed. 792.

In *New York Belting Co. v. New Jersey Rubber Co.*, 137 U. S. 445, this Court said:

"We are in the habit of regarding a design as a thing of distinct and fixed individuality of appearance—a representation, a picture, a delineation, a device."

In *Pelouze Scale & Mfg. Co. v. American Cutlery Co.*, 102 Fed. 916, a design is defined as that characteristic of a physical substance which by means of lines, images, configuration and the like, taken as a

whole, makes an impression through the eye upon the mind of the observer.

The Century Dictionary has defined the word "design":

"1. A drawing, especially in outline or little more; *any representation made with pencil, pen or brush.* 2. A plan or an outline in general; any representation or statement of the main parts or features of a projected thing or act; *specifically, in arch, a plan of an edifice, as represented by the ground-plans, elevations, sections, and whatever other drawings may be necessary to guide its construction.*" (Italics ours.)

The term "design" is defined as follows in the Standard Dictionary:

"1. An arrangement of forms or colors, or both, intended to be executed in hard substances or pliable material, or to be applied to a fabric for ornament. It may be (1) *technical*, to serve some useful purpose; as, a *design* for a chandelier; (2) *decorative*, to beautify a useful object; as, a *design* for a wallpaper; or (3) *pictorial* or *artistic*, to give lasting expression to an ideal; a preliminary sketch, as for a picture or a statue; a study; as, a *design* for a memorial arch.

"2. A working plan to be used in the accomplishment of something projected; especially, the plan of an architect, engineer, machinist, or master of some useful art.

A poet does not work by square or line,
As smiths and joiners perfect a *design*.

Cowper Conversation 1. 797."

It is perfectly clear from the contracts themselves, and from the correspondence which preceded the first contract that the terms "device" and "design", were intended to mean something

tangible and concrete and not a mere idea or suggestion. When the parties referred to a device they of course meant some contrivance which could be installed in the torpedo.

The Government relied upon the letter of October 19, 1905, as illustrating the definition of a device for a design as used by the parties in this case. They, however, seized upon the last sentence of the letter referred to. It will be observed that the letter expressly excludes suggestions and ideas. That it was the intention to exclude suggestions and ideas is evidenced by the subsequent correspondence between the parties.

On October 21, 1905, the Ordnance Bureau replied to the letter relied upon of October 19th, approving the illustration depended upon by the plaintiff and enclosing a draft of the secrecy clause which the Government proposed to have signed and which it assumed coincided with the intent of the parties. This draft provided that the Government would furnish to the defendant all possible *information, advice and suggestions* looking towards the further improvement and development of such torpedoes, and provided that the Bliss Company agree not to make known or communicate any such *information, advice or suggestions*. By this letter, the Navy Department attempted to place precisely the same interpretation upon the letter of October 19, 1905, as is now attempted to place upon it. The Bliss Company, however, refused to accede to the request that this secrecy clause be signed. The new one signed excluded the very words upon which the defendant will be compelled to rely for its definition of the word "design".

POINT III.

The restrictive clause is a secrecy clause. The Government has published to the world by the issuance of the Davison patent and otherwise the nature of the Balanced Turbine under which it claims, and has therefore waived secrecy.

This restrictive clause must be construed against the Government because drawn by the Government. Further, it is a restriction on the defendant's power of alienation of its own property. The torpedo is the product of the assiduity and genius of the defendant's officers and engineers, and not that of the Government, as it seemed to be assumed in the opinion of the Court below (pp. 549-553). The appellee is indebted to the defendant for the use of its torpedo, not the appellant to the Government for the privilege of making torpedoes for it. The appellee must therefore clearly show that the devices claimed are within the prohibitive clause to restrain the defendant of its right of alienation of its own property.

The intention of the Government is clear. It is well recognized that it is highly desirable for a nation to keep secret methods and implements of conducting warfare from other nations. At the time of the original contract November 22, 1905, the Government maintains, the defendant's torpedo was public property (p. 312, Ex. 22). If in the course of its experiments the Government made discovery of any valuable device (Ex. 21, p. 314) which it was practicable to keep secret from the

other nations of the world, defendant was prohibited from communicating such improvement either by a sale of its torpedo or by demonstrating the torpedo containing such improvement. It was practicable only to confine such secret to concrete improvements. For greater certainty, it was provided that no device or design should be considered as coming within the provision of the contract unless the Government shall state to the appellant in writing, at the time when the said device or design is itself conveyed to the appellant by written communication from the Government, that the said Government considers that the device or design thus simultaneously conveyed is embraced within the provisions of the prohibitive clause.

That the Government interpreted this restrictive clause as a secrecy clause is clear from the attitude of its counsel upon the trial, wherein the said clause is constantly referred to as a secrecy clause (pp. 19, 20, 21). During the trial, the Government repeatedly referred to the clause in issue as a secrecy clause. The clause reads:

"That the party of the first part (Bliss) will not exhibit such device or in any way describe it to or give any information in regard to it * * *. That the party of the first part (Bliss) will not exhibit the performance of any torpedo containing such device" (pp. 2, 386).

If, therefore, the device claimed was publicly known, the restrictive clause will not apply.

If, as contended by the appellee, any design or device given by it to the appellant is intended by the clause in issue, it would lead to an unreasonable and ridiculous result. It is elementary that a rea-

sonable, rather than an unreasonable, construction of a contract will be adopted, and that the Court will endeavor to give a construction most equitable to the parties and which will not give one of them an unfair or unreasonable advantage over the other.

Bell v. Bruen, 1 How. 169.

Sanford v. Brown Brothers Co., 208 N. Y. 90.

In the latter case, the Court said:

"It is a well established canon of interpretation that in seeking for the intent of parties, the fact that the construction contended for would make the contract unreasonable and place one of the parties at the mercy of the other may be properly taken into consideration." (*Schoellkopf v. Coatsworth*, 166 N. Y. 77-84.)

In the event, for instance, defendant chanced to be ignorant of a device generally known, used in the Whitehead torpedo, if appellee furnished a design of such device, could it be said to be within the protective clause of the contract? To answer in the affirmative would mean that the whole world except the defendant could use the device. This, of course, would be unreasonable. Such a construction will be avoided.

Counter-revolution turbine wheels were publicly known, as we shall hereafter point out, when the Davison design was alleged to have been furnished. The balance turbine principle was public property and not the property of the Government. It was a matter of public knowledge and not a secret. Hence, as to this particular subject-matter, the Government possessed nothing which it could furnish to the defendant.

Assuming that the particular design of a balanced turbine produced by Davison was a secret, it lost every attribute of a secret upon the issuance by the United States Government of letters patent to Davison. Davison in his very application for letters patent, which were assigned to this complainant and upon which the complainant relies, states:

"I do hereby declare the following to be a full, clear and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same" (p. 431, Ex. 3).

This is a public invitation to the world to take cognizance of his patent and of his invention and design.

If prior to that time there had been anything secret in this design, it ceased to be secret upon the issue and publication of this patent. The application for letters patent produced by the Government continues:

"My invention relates to methods of and means for compensating torpedoes driven by turbines."

If the principle of the balanced turbine as applied to torpedoes had been in any way secret prior to that date, it then becomes a matter of public knowledge.

This Court will undoubtedly take judicial notice of the fact that letters patent are not secret, but public; that printed copies thereof may readily be had by application to the United States Patent Office (Revised Stat., Sec. 493; Comp. Stat. 1913, secs. 753-756), and that the grant of patents is publicly announced in the Official Gazette of the United States Patent Office.

That they became public property in foreign

countries is shown by the complainant, in offering in evidence the British patent to Davison (Ex. 49), supplemented by the testimony of Davison that the invention was patented in Great Britain, France, Japan, and probably elsewhere, which foreign patents were assigned to the Bliss Company with the knowledge and sanction of the Navy Department (pp. 94, 95). Davison had previously assigned his American application to the Navy Department (Ex. 4, p. 414). Therein the United States acquired title to this patent. The issuance of this patent, therefore, became an act of the Navy Department. Thus, the Government through the same department by which it entered into the several contracts with the defendant, caused the alleged secret of the balanced turbine to be laid open to the public.

This act cannot be construed otherwise than as a waiver of the obligation of secrecy as to the balance turbine. The Government having itself exposed the Davison design can no longer hold the defendant to any obligation to maintain secrecy thereof.

The purpose of the secrecy clause was to prevent knowledge of new inventions to the other nations of the world. By the issuance of patents, both domestic and foreign, the purpose of the clause is frustrated by the plaintiff itself. The patents disclose minutely details of plaintiff's alleged device and the purpose to which it may be put (pp. 431-436). No injury can be done the complainant, even assuming defendant's torpedo contains the appellee's device.

The injunction decree forbids the defendant to divulge that which everybody informed in this art already knows, and as to which everybody has adequate sources of information. An injunction to

restrain the breach of a contract will be granted only to prevent irreparable injury. If the world knows of plaintiff's device, no irreparable injury can be suffered by repetition of such knowledge. Hence, an injunction was improperly decreed.

World's Columbian Exposition v. United States, 56 Fed. 654.

James T. Hair Co. v. Huckins, 56 Fed. 366.

Burdon Century Sugar Refining Co. v. Leverich, 37 Fed. 67.

Chicago, etc., R. R. Co. v. New York, etc., R. R. Co., 24 Fed. 516.

Southern Bell Tel. & Tel. Co. v. City of Birmingham, 211 Fed. 709.

The position of the defendant is somewhat analogous to that of the holder of a trade secret. It is well settled that once a process or trade secret has become generally known, regardless of the contract between the parties, its further promulgation will not be protected by injunction.

Bell & Bogart Soap Co. v. Petrolia Mfg. Co., 25 Misc. (N. Y.) 66.

National Tube Co. v. Eastern Tube Co., 23 Ohio Circ. Ct. 468.

Chain Belt Co. v. Von Spreckelsen, 117 Wisc. 106 (94 N. W. 78).

In this instance, the complainant took the initiative in making public the torpedo secret, if we may call its alleged design a secret. It prosecuted the application of Davison for a patent in this country. It tacitly permitted Davison, one of its officers and subject to its discipline, to assign to this defendant foreign patents for the device in issue. It cannot now successfully contend that its design is within the restrictive clause.

POINT IV.

The unrestricted sale of the existing design of torpedo is recognized by the contract of June 12, 1912, the alleged breach of which has been enjoined by the decree appealed from.

The clause restricting the sale of torpedoes by excluding devices, the design of which was furnished the appellant by the appellee, was inserted in the first contract for the manufacture of Bliss-Leavitt torpedoes, made on November 22, 1905. This was the first contract, upon which the decree appealed from is based.

The Davison design is alleged to have been furnished before the completion of that contract, and the Government claims that the defendant is prevented in perpetuity by clause 19th of that contract from selling torpedoes containing that design to persons other than the United States Government. The court of original jurisdiction adopted that view (p. 271).

When the contract of 1912 was executed, a provision was inserted in it which expressly authorized the defendant to sell, and the decision of the Court denying our right to sell is tantamount to a rescission of that provision of the 1912 contract, which was an essential part of the consideration.

The material parts of the provision giving the defendant the right to sell reads:

“Second. The manufacture of said torpedoes (the word ‘torpedoes’ as used throughout this contract being intended to include everything covered by the drawings, plans, and specifications above referred to) shall conform in all

respects to and with said drawings, plans and specifications, including duly authorized changes therein, but said drawings, plans and specifications are not hereto annexed or made a part hereof. They contain information of a confidential character that can not be made public without detriment to the Government's and the contractors' interests, and they are to be treated as confidential by the parties to this contract, it being understood, however, that nothing in this clause shall be construed as depriving the party of the first part (Bliss) of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth of this contract" (pp. 388, 389).

This clause was not contained in the 1905 contract or in any of the six contracts intermediate to the 1905 and 1912 contracts. In the interval, however, the Davison design had been furnished and the patent thereon issued.

In 1911 the question as to the right of the appellant to sell torpedoes abroad containing a balanced turbine had been raised by the Government and discussed by the parties (pp. 364, 363, 362, Exs. 12, 13, 14). Leavitt, the defendant's engineer, had designed a new turbine, differing both in structure and function from the Davison turbine and another one had been designed by the defendant known as the Dieter design. Hence the 1912 contract was executed by the parties with full knowledge of previous occurrences, and the clause authorizing the defendant to sell torpedoes except as limited by clause 20th was part of the consideration and was deliberately and advisedly agreed upon. The only

limitation upon defendant's right to sell torpedoes is contained in clause 20th. This provides:

1. That the Bliss Company will "not make use of any device, the design for which is furnished" by the Government, in any torpedo constructed or to be constructed for any third party.

2. That the Bliss Company will not exhibit such device or in any way describe it or give any information with regard to it to any third party.

3. That the Bliss Company will not exhibit the performance of any torpedo containing such device to any third party.

Then follows the remedy of the Government in the event of a breach of this clause by the Bliss Company.

The contract continues:

4. That no device or design shall be considered as coming within the provisions of this clause unless the Government shall state to the Bliss Company in writing, at the time when the said device or design is itself conveyed to the Bliss Company by written communication from the Government, that the latter considers that the said device or design is embraced within the provisions of this clause (p. 387, *et seq.*).

The balanced turbine principle was known and used before the 1912 contract was made. If it was a device, the design for which was furnished by the Government, it was furnished before the 1905 contract was completed. If the 20th clause of the 1912 contract covered this principle, assuming it to be

a device, then the clause must be assumed to cover past devices and also past notifications.

This clause refers to any devices the design for which "*is*" furnished and provides that the Government "*shall state*" in writing, if the device "*is*" conveyed, that it considers that the device is embraced within the provisions of this clause.

If the intention had been to cover the balanced turbine, the clause would have covered any device which is furnished *or which has been furnished*, and the provision as to notice would have been that no device came within the clause unless the Government shall state or has stated. The clause did not expressly refer to or incorporate devices which had been furnished in the past or notifications which had been made in the past. On the contrary, it is expressly limited to notice that the device comes within the provisions of this clause—that is, clause 20th of the 1912 contract.

It cannot be presumed that the intention was to cover past devices and notifications. Such presumption is excluded where the contract, as here, is expressly limited to notice that the device comes within the provisions of this clause.

Clause 2nd expressly recognizes the appellant's right to sell Mark VII torpedoes, except as limited by the 20th clause. The specifications require the balanced turbine to be used in the Mark VII torpedoes. The clause permitting their sale would therefore be entirely nugatory if the sale of torpedoes containing this principle was prevented by the 20th clause. If such had been the intention, there would have been a prohibition of the sale rather than a recognition of the right to sell.

The District Court seems to have misunderstood

our claim as to the effect of clause 2nd of the 1912 contract. The appellant claims that this clause expressly gives it the right to sell. The appellant did not claim, as apparently the Trial Court thought, that the 1912 contract covered the same subject-matter as the 1905 contract and therefore superseded it by implication of law (pp. 270-271). The 1905 contract related to Mark I, II and III torpedoes. The 1912 contract related to Mark VII torpedoes. The principle to which the Court referred (implied substitution of one contract for another) has no bearing upon the principle of express authorization to do something conferred by the written provisions of a subsequent contract forming an essential part of the consideration.

The appellee claims that we have no right to sell Mark VII torpedoes containing a balanced turbine, because clause 19th of the 1905 contract prevents it. On the contrary, appellant claims to have the right to sell such torpedoes, because clause 2nd of the 1912 contract confers it:

"As a contract is the result of agreement, so an agreement may put an end to a contract. Therefore a contract may be discharged at any time before the performance is due, by a new agreement with the effect of altering the terms of the original agreement or of rescinding it altogether; and a claim under the original contract may then be met by the new agreement, so far as the latter operates to alter or rescind the former" (*Cyc.*, Vol. 9, p. 593).

"If agreements be made between the same parties concerning the same matter, and the terms of the latter are inconsistent with those of the former so that they cannot subsist together, the later will be construed to discharge the former" (*Cyc.*, Vol. 9, p. 595).

The parties were at liberty for a valuable consideration to confine the scope of clause 19th in the 1905 contract and to place such limitations upon it as they saw fit. Clause 2nd of the 1912 contract expressly authorized the sale of Mark VII torpedoes except as limited by the provisions of that contract.

To sustain the injunction would amount to a judicial rescission of an agreement deliberately entered into between the parties and the substitution of a new agreement.

POINT V.

No written notice was conveyed to the defendant from the appellee that the said appellee considered that Davison's alleged device for a balanced turbine is embraced within the provisions of clause 19th of the contract.

Assuming that the device contained in Davison's blue print (Ex. 28, p. 430) amounts to a design within the provisions of the contract between the parties, the complainant is entitled to no relief unless it affirmatively shows that it has stated to the appellant in writing, at the time when the said device or design was conveyed to the Bliss Company by written communication from the Government, that it considers the said device or design to be embraced within the provisions of the contract.

Evidence of service of such notice must be clear and convincing. It must conclusively be brought home to the defendant.

The notice upon which the complainant relies is the alleged delivery to the defendant of a letter written by the commander of the Torpedo Station at Newport to the Chief of Ordnance Department, with the latter's endorsement thereon. The original letter addressed to the Chief of Bureau of Ordnance at Washington is dated January 2, 1907. It states merely that it enclosed two copies of blue prints designated 117 E, describing the design purporting to be included within the blue prints. The Chief of Ordnance on January 9, 1907, writes that he forwards the said blue prints to the Inspector of Ordnance at the works of the defendant for the information of the defendant. It is stated in this letter that the balanced turbine falls within the provisions of clause 19th of the contract for the manufacture of 21-inch torpedoes.

The appellant respectfully submits that there is absolutely no competent evidence in the case to show any delivery of this alleged notice on the defendant and that the said letters were erroneously admitted in evidence and should have been stricken from the record.

The appellee relied for proof of delivery of such notice on the testimony of the orderly or clerk to the Government's Inspector of Ordnance at the defendant's works. His testimony is vague and indefinite, and when analyzed constitutes absolutely no proof of any delivery of notice. It is based entirely upon conjecture. The witness had no definite recollection of the delivery of the notice in issue. His testimony amounts to a conclusion. He testified that it was his custom to deliver letters from his superior to the office of the secretary of the defendant company (pp. 58, 59, 62).

He had no independent recollection of delivering

the letters in issue (p. 61). There is no testimony as to whom the delivery was made for and on behalf of the company. In fact, the witness did not know whether he delivered them to any one or merely left them in the defendant's offices (p. 63).

The appellee claims that the presence of the defendant's stamp on the letters is some evidence of delivery to the defendant. The appellee's messenger, however, testified that he put the seal on papers occasionally and that he may have put it on this exhibit (pp. 63, 64).

The Appellate Division of the Supreme Court of New York in *Fitch v. Shubert Theatrical Co.*, 174 App. Div. 229 (1916), upheld a ruling declining to receive a letter in evidence on evidence somewhat similar to that in the case at bar. The Court said (pp. 232, 233):

"After having called upon the plaintiff to produce that letter and upon the assertion that no such letter was received the defendant offered a letter-press copy of such a letter, which the trial judge refused to receive, and this ruling is claimed to have been such error as to call for the granting of a new trial. In this letter-press copy of this letter it is stated that the defendant had obtained the German rights. While there is considerable proof as to the custom of dictating letters to a stenographer and the stenographer thereafter placing them in some receptacle, there is no proof that it was mailed by an office boy whose duty it was to take these letters to the post office or that such was their custom or that they actually took letters regularly in this way to the post office. It is unnecessary to discuss this evidence, because in *Gardam & Son v. Batterson* (198 N. Y. 175) it was held that evidence much stronger than that in the case at bar was insufficient to authorize its introduction, and defendant's counsel upon the argument concedes that the

proof alone is not sufficient within this authority. The claim of the defendant's counsel, however, is that in this letter of February fifteenth Megrue demanded a confirmatory letter from Shubert and thereafter and upon February twenty-third Megrue again wrote to Shubert and did not repeat the demand for a confirmatory letter but treated the matter of the royalties as settled upon the basis desired by Shubert. The inference is sought to be drawn from this failure to repeat the demand in the letter of February twenty-third that the confirmatory letter, a copy of which is sought to be introduced, had been in fact received by Megrue. The mere fact of failing to renew the request for a confirmatory letter cannot be deemed such an admission of the receipt of the letter claimed to have been written as to make this letter competent evidence."

In *Gardam & Son v. Batterson*, 198 N. Y. 175, the testimony was that the original letters, of which copies were offered in evidence, were addressed to the plaintiff, sealed, stamped and put in a box or tray. The witness testified:

"They were put on my desk to be mailed in the post office the same as I always do with every letter going from my office. * * * They were put there for the purpose of being mailed by somebody in my employ. * * * The letters were taken from that tray periodically through the day * * * by the clerk whose duty it was to gather up the mail and post it. That was the way that all mail that emanated from my office always went through the post. That was the regular course of business in my office every day."

The Court of Appeals of the State of New York held that this proof was insufficient to show the mailing or delivery of the letters.

The scant and unsatisfactory proof of this de-

livery when considered in conjunction with the indefinite, vague and contradictory proof in the case, go far beyond the rulings of the above cited cases.

Inspector McCormick, to whom the letters were sent for delivery to the defendant, testified in the most positive manner *that he had personal interviews and telephone conversations with Mr. Page, the defendant's vice-president and general manager, between January 9 and January 21, 1907, regarding these papers in which it is claimed that the notice was contained (pp. 33, 34).* It appears uncontradicted that *during this interval, Mr. Page, the defendant's vice-president and general manager, was absent in Europe, making the alleged conversations in regard to these papers impossible.* Mr. Page had sailed for Europe prior to their receipt by the appellee's inspector McCormick and remained there until long after the Government says they were returned to Washington (pp. 132-134). The witness Williams, testifying for the plaintiff, says that the blue print which was alleged to have been enclosed with the letter containing the notice relied on were separately mailed to McCormick (p. 35). McCormick, on the other hand, together with his orderly, testified that they came together (pp. 27, 29, 58).

The only communication to the Bliss Company in these letters the Exhibit 29 (pp. 334-336) is the second endorsement, the subject of which is the blue print 117-E. It contains no reference, either directly or indirectly, to the 19th clause of the contract. The only reference to that clause is in the first endorsement, which was said to be pasted between the letter and the second endorsement, and which was not a communication to the Bliss Company but to Inspector McCormick.

If any inference is to be gathered from the testimony in evidence, it is that upon receipt of these papers the blue print, which was the subject of the second endorsement to Mr. Leavitt, might have been sent to the Bliss Company. Mr. Leavitt, the defendant's engineer, states that he found this blue print on his desk some time in the month of January, 1907 (p. 186). In the regular course of business, a written notice to the Bliss Company calling attention to the 19th clause would have reached either Mr. Leavitt, the chief engineer and inventor of the torpedo, or Mr. Page, the general manager of the company (p. 192). Both of these witnesses testify that the notice was never received by them. They further testify that they did not learn that the Government claimed Davison's design within the secrecy clause until 1911 (pp. 134, 192). On December 10, 1912, the defendant wrote the plaintiff that no notice accompanied the Davison design or blue print (Ex. 11, p. 365).

The surrounding circumstances clearly show that the letter of January 9th, written by the Chief of the Bureau of Ordnance to the Naval Inspector at the Bliss works, was never intended as a notice under clause 19th of the contract. The original letter from the Torpedo Station at Newport and all the subsequent letters included in that exhibit refer to the blue print as a system of gearing and not as a design of a balanced turbine. The references to clause 19th of the contract in the endorsement or note of the Bureau of Ordnance to the Naval Inspector at the Bliss works was obviously solely for the information of the Bliss inspector. It was not a notice from the Navy Department to the defendant and was not intended as such. It

will be observed that in all the correspondence issued by the Navy Department, every subject is covered with minute particularity. If it had been intended to give the defendant any notice that the Davison system of gearing was embraced within the provisions of section 19th of the contract, the notice would have been addressed to the Bliss Company and would have stated in definite terms that the blue print was enclosed and that the appellee claimed the protection of clause 19th of the contract.

Proceeding a step further, and assuming for the purposes of this discussion that the testimony of the plaintiff is sufficient to show a delivery of any notice at the defendant's office, it is insufficient to show notice to the defendant under the secrecy clause of the contract. The testimony was merely that the witness thought he had left the letters Exhibit 29 at the defendant's office. He does not know with whom he left the letters. Even though they had been left at the defendant's offices, we submit that this would be insufficient to show knowledge or to show notice to the defendant.

The defendant cannot be bound unless it appears that the officers, directors and controlling executives of the defendant had knowledge of this notice and its contents. The notice must have been brought home to the executives of the defendant company. The knowledge of an unauthorized clerk is insufficient.

McDermott v. Hayes, 197 Fed. 129.

Seegar Refrigerating Co. v. American Car & Foundry Co., 171 Fed. 416; *aff'd* 178 Fed. 278.

Jemison v. Citizens Sav. Bank, 122 N. Y. 135.

Lord v. United States Transp. Co., 143
N. Y. App. Div. 437.

*Bright v. Canadian International Stock
Yard Co.*, 83 Hun 482 (N. Y.).

In *McDermott v. Hayes*, *supra*, the Court said
on this point (p. 135) :

"The prevailing rule upon this subject in
the federal courts is that notice to an officer of
a corporation is not such notice to the corpo-
ration as to affect its rights, unless such notice
or knowledge of the officer is in regard to a
matter coming within the sphere of his duty
while attending to the business of the com-
pany, and acquired while acting in regard to
the same. *Armstrong v. Ashley*, 204 U. S. 272,
283, 27 Sup. Ct. 270, 51 L. Ed. 482; *Fidelity &
Deposit Co. v. Courtney*, 186 U. S. 342, 363,
364, 22 Sup. Ct. 833, 46 L. Ed. 1193."

There is not even proof of notice to an officer
here. On the contrary, that there was no notice to
an officer is affirmatively shown.

A notice to a corporation of a position taken by
any one dealing with it must be made to one whose
duty it is to act upon it; otherwise it is ineffective
to bind the corporation.

Fulton Bank v. New York, etc., Canal Co.,
4 Paige (N. Y.), 127.

POINT VI.

The blue print of Davison's alleged design of balanced turbine was not a device the design of which was furnished to the defendant within the meaning of the contract sued on.

Assuming that the complainant served the notice it claims it did, such service is no evidence that the design relied on is a design of a device within the contemplation of the contract.

The rotation of two turbine wheels in opposite directions was a well known and familiar principle. Lieutenant Davison did not furnish or pretend to furnish any design showing a device for this principle.

The letter of January 2, 1907, on which the appellee relies, does not claim to enclose a design of a device of a balanced turbine. It portends only to be a design of gears. It states that it has no especial value and that many others are equally as good (Ex. 29, p. 334). It will be remembered that the contract is to include only discoveries of value (Ex. 21, p. 314). The Ordnance Department on receipt of this letter did not understand it to claim any design for a device of balanced turbine, but merely a design of one of many devices for gears. This is shown by the letter transmitting it to the Inspector of Ordnance at the Bliss works. The letter states that it *shows gears* for balanced turbine. While forwarding the blue print of the gears, the Chief of Bureau of Ordnance informs the Inspector of Ordnance at the Bliss works that the balanced turbine falls within clause 19th (p. 335). The Inspector of Ordnance at Bliss works,

in turn, intending to pass the letter on to the appellant, states that he is forwarding blue print *showing gears* for balanced turbine.

In reporting to the Ordnance Department, this same inspector says that the subject of his report is the forwarding of blue print showing *gears* for balanced turbine. The same inspector, Commander McCormick, describing the alleged blue print relied upon to enjoin the use of a balanced turbine, says that it (117-E, Ex. 28) shows *gears* for balanced turbine (p. 26).

Assuming, therefore, that the disputed notice had been served on the defendant, it is not sufficient under the contract between the parties. The contract provides regarding notice that "no device or design shall be considered as coming within the provisions of this clause unless the party of the second part (United States Government) shall state to the party of the first part (Bliss Company) in writing, at the time when the said device or design is itself conveyed to the party of the first part (Bliss Company) by written communication from the party of the second part (United States Government), that the party of the second part (United States Government) considers that the said device or design is embraced within the provisions of this clause." The device enclosed claimed only to be for gearings for balanced turbine. The Government did not pretend to give defendant any design of a device for a balanced turbine. The complainant's own witness, Commander Williams, said that the only novel feature in the design was that of gearings (p. 79). Defendant's expert showed that the defendant did not use Davison's device for gearings in the existing torpedo (p. 126). The plaintiff's own witnesses testified that

the gearing used by the defendant was different than that shown on the design relied upon by the appellee (p. 41). Appellee was in no position to claim any rights to the balanced turbine.

At the time of the alleged notice to the defendant, the balanced turbine *per se* was a widely and publicly known device.

This is clearly shown by the issuance of many patents covering this subject. Those in evidence are as follows:

(a) Curtis U. S. Patent No. 566,968 of September 1, 1896 (Ex. 104, p. 446), which shows in Fig. 11 two oppositely revolving turbines.

(b) Parsons U. S. Patent No. 729,215 of May 26, 1903 (Ex. No. 105, p. 462), which shows oppositely revolving turbines applied among other uses to the propulsion of a vessel by means of oppositely revolving propellers driven by the respective turbines.

(c) Wilson's British Patent No. 12,026 of 1848 (Ex. No. 143, p. 515), which shows oppositely revolving turbines geared together and to a common shaft driven by both, so that the turbines are compelled to turn at equal speeds in contrary directions.

(d) De Ferranti British Patent No. 9496 of 1904 (Exhibit No. 106, p. 468), which shows and describes oppositely revolving turbines as applied to an automobile torpedo for driving the propellers thereof.

(e) Wheelless U. S. Patent No. 818,987 of April 24, 1906 (Ex. No. 144, p. 517), which shows and describes oppositely revolving turbines as applied to an automobile torpedo for driving the oppositely revolving propellers thereof.

The defendant's expert explained the workings

of each of the foregoing patents, and also testified that the turbine shown on Davison's system of gearings covered the same subject. It is also pointed out that the only difference between the foregoing patents and the Davison patent is that Davison has a different system of gearing (pp. 125-126, 231-232). In addition to the above patents and cumulative of the Wilson British patent, the following patents also illustrate two oppositely revolving turbines geared together and to a shaft driven by them so that the turbines are forced to revolve in contrary directions at equal speed:

(f) Brady U. S. Patent No. 643,938 of February 20, 1900 (Ex. No. 156, p. 538).

(g) Boyce U. S. Patent No. 693,946 of February 25, 1902 (Ex. No. 157, p. 541).

The foregoing patents show unmistakably that

(1) Oppositely revolving or counter-revolution turbines were well known in the turbine art.

(2) It was well known to connect such turbines together through gearing so as to force them to revolve at exactly equal speeds in contrary directions. As the turbines shown are substantially or exactly alike, it follows that their masses are equal and that when thus geared together they are necessarily balanced in the strictest sense.

(3) That such oppositely revolving turbines had been applied for driving through concentric shafts the oppositely revolving propellers of ships and torpedoes (torpedoes being merely a form of submarine boat).

(4) That all these things were matters of public knowledge accessible to the entire world long prior to January, 1907, the date of the alleged furnishing of the balanced turbine to the defendant.

Whether for the correction of gyroscopic action or nozzle reaction, the expedient of providing two turbine wheels to turn in opposite directions at equal speeds, is shown by the entire prior art and all the evidence in this case to be one which has in numerous instances been resorted to for a variety of purposes. It was adopted by Curtis, Parsons, de Ferranti, Wheless, and Leavitt.

Prior to the date of Davison's claim of design, the balanced turbine had been suggested and discussed in the Torpedo Board report of October 13, 1903 (Ex. 133, pp. 298-309). This report suggests that if the gyroscopic energy of the turbine should in future trials be found to disturb the accuracy of the torpedo, "a feasible and practicable remedy would be to substitute for the one turbine a pair of twin turbines revolving in opposite directions, geared together and to the main shaft" (p. 305).

In 1898, defendant's engineer, Mr. Leavitt, designed a balanced turbine, which was constructed at the works of the Bliss Company (pp. 172, 162-163). A torpedo containing it was tested in 1899 (p. 174). Leavitt's original balanced turbine was somewhat different from the later Dieter design, and was also different from the balanced turbine shown on Davison's system of gearing, which was never used. It was similar to the more recent Leavitt design, which was installed in the Mark VI and Mark VII torpedoes, and has been used since 1912.

The defendant's engineer, Mr. Leavitt, freely described his original balanced turbine made in 1898 in detail. He testified:

"There are two turbine wheels rotating in opposite directions on a shaft which runs across

the torpedo, these turbines are connected through gearing with the two propeller shafts which revolve in opposite directions; there is a train of gears on each side which connects each turbine to the two shafts, so that each turbine drives each of the two revolving shafts; either one will drive both shafts. * * * The two shafts revolve in opposite directions" (p. 172).

He then explained the gearing:

"On the shafts of each of the turbine wheels there is a gear which meshes in with a gear, each one meshing with an independent gear, and these in turn mesh with gears on a shaft which runs across, abaft the turbine; attached to the two gears on each side are two miter gears, and these miter gears mesh with one gear on the inside propeller shaft and one gear on the outside propeller shaft, so the whole are brought together in one system; in other words, the turbine on the left-hand side will drive through the system both the inside and outside shaft, and the turbine on the right-hand side will do the same thing through its train of gears" (p. 173).

Exhibit 127 is a side elevation of the balanced turbine (p. 173).

Lieutenant Davison stated that his design shows reducing gears on axes parallel with the main axis of the propeller shaft and turbines, all the rotating axes being parallel (p. 93). In that respect it resembled the gearing in the Leavitt design of unbalanced turbines that he had previously seen tested at Sag Harbor (p. 93). The only difference was that Davison mounted the second stage turbine wheel so that it would turn independently and introduced idler gears or pinions for reversing the motion; otherwise the gearing was exactly the same

as in Leavitt's design, and the supporting framework and general mechanical design were the same (p. 93).

The changes which Davison made during his experiments did not concern the turbine wheels, but concerned, as we have previously pointed out, the gearings, bearings and mechanical details (pp. 93, 94).

Davison's alleged invention of the balanced turbine was nothing more than an act of unconscious cerebration in recalling a mental impression that he had received of the early Leavitt balanced turbine. In 1902, Leavitt told Davison regarding his earlier balanced turbine contained in the torpedo (p. 179). That Davison had knowledge of Leavitt's earlier turbine is apparent from his report (Ex. 101), in which, after discussing the 1902 turbine, he said:

"The turbine for torpedoes constructed by E. W. Bliss Company a few years ago was not of the same type as the present one, though the principle was, of course, much the same" (p. 295).

It is significant that all that Davison did was to take Leavitt's design of unbalanced turbine shown in Patent No. 747,759 (Ex. 50), and reverse one of the turbine wheels with the incidental and necessary change in the gearing.

The only purpose of Davison's experiments was to correct the tendency of the torpedo to roll when it was first fired out of the tube (pp. 86, 92).

The Government now claims that the Davison device consisted merely of two counter-revolution turbine wheels on concentric axes. Indeed this is the

sole basis of its claim set forth in the complaint. The bill states:

"That the efficiency and value of the several torpedoes above mentioned is entirely due to the use therein of turbines revolving in opposite directions for the propulsion of the torpedo, to wit: the balanced turbine method of propulsion; and that this feature of torpedo construction was conceived in the Bureau of Ordnance and in the latter part of 1906 and in the early part of 1907, and that the defendant, the E. W. Bliss Company, was duly informed thereof under the protection of the clause quoted."

No such claim was made by Davison. He knew full well that this did not constitute his invention and that it was a familiar and well known mechanical device, in which neither he nor any one else had, or could have, any ownership or claim of originality. The large number of patents, including patents for the driving mechanism of torpedoes, which had been issued before Lieutenant Davison's patent, which showed counter-revolution wheels, negatives the Government's claim of ownership of the same, or that it ever furnished any such mechanical method or idea.

The Government's claim is based on the elimination of the only essential features introduced by Davison. The Government eliminates his specific arrangement of the turbine wheels. It eliminates his specific gearing. It eliminates the distinction on which he secured the grant of his patent, namely, the dynamic balance of the oppositely rotating masses. None of these features are contained or proven to exist in the existing type of defendant's torpedo.

The gearing is an essential element, as without it the propellers would not necessarily turn in op-

posite directions. The designing of this gearing is what occupied Lieutenant Davison's time and thought. That was the Government's notion of it when his design was forwarded from the Torpedo Station to the Bureau of Ordnance at Washington, and in turn from that Department to the Naval Inspector at the Bliss works, and finally returned by that Naval Inspector back to the Bureau of Ordnance. The purpose obviously was to have a complete balanced turbine mechanism so that the opposite moments of inertia of the revolving masses would be balanced throughout. This involved an arrangement of gearing so that the rotors and gearing and entire mechanism would be balanced and so that the rotors would revolve in opposite directions at equal speeds.

POINT VII.

When the Davison alleged design of balanced turbine was made, the defendant was using its own design, which was radically different. The Davison design has never been and is not now used.

The Davison design (blue print 117-E, Ex. 28), which has been previously described, was found by Mr. Leavitt, the defendant's engineer and the inventor of the torpedo, in January, 1907. Mr. Leavitt found it on his desk with no accompanying explanatory communication. At that time, the Bliss Company was altering the turbines in the torpedoes to conform to what has here been described as the Dieter design (pp. 186, 187). Mr. Leavitt com-

pared the Davison and Dieter designs (p. 187), and decided that the former was impracticable (pp. 189, 190). For this reason, the Bliss Company has never constructed a balanced turbine according to the Davison design (p. 191), and the Bureau of Ordnance has never requested it to do so (p. 191). That the naval design was never used and that the Government never requested the appellant to use it, was admitted by Commander Williams, one of the Government's chief witnesses (p. 52).

The defendant's engineer has pointed out the following radical differences between the Davison design and the Dieter design:

(1) In the Davison design, the forward turbine was mounted rigidly on a revolving shaft; whereas, in the Dieter design, it was mounted to revolve on a stationary shaft.

(2) In the Davison design, the after turbine revolved on the shaft of the forward turbine; whereas, in the Dieter design, the after turbine was independent of the forward turbine.

(3) In the Davison design, the two turbines revolved at equal speeds; whereas, in the Dieter design, they revolved at unequal speeds.

(4) In the Davison design, the two shafts transmitting the power revolved the one relatively to the other at a difference of speed of 20,000 revolutions a minute; whereas, in the Dieter design, the speed at the bearing surfaces was reduced to 10,000 revolutions a minute (pp. 189-192).

It is admitted by the parties that the Davison design was more similar to the Dieter design than to the subsequent Leavitt design, which is used in the existing type of torpedo. Commander Williams

stated that as far as the turbine shown in the Davison design is concerned, it is essentially the same as that installed in the 5.2 meter by 21-inch Mark II and Mark III torpedoes. The gearing, however, is different (p. 79). The Mark II and Mark III torpedoes were supplied under the 1905 contract and have the so-called balanced turbine (p. 81), constructed according to the Dieter design (p. 187). The only similarity between the Davison and the Dieter designs was the fact that the two wheels turned in opposite directions.

The Government throughout has rested its case on the admission that this is the only similarity. The Trial Court has defined the word "furnish" to mean simply supplying a device not then in use in the torpedo (p. 270). Accepting, but not conceding, the Government's narrow claim, the Court failed to apply its own definition.

The Dieter design, which is admittedly more similar to Davison's than to that in the existing type which is enjoined, was in use in the torpedo when the Davison design was furnished. This fact is not disputed. The decree necessarily assumes that the principle of counter-revolution turbine wheels was the only essential feature of the Davison design. If that is so, then it was just as clearly the only essential feature of the Dieter design, which was the one in use when the Davison design was furnished. Therefore, under the construction of the contract which the Government urged and which the Trial Court accepted, the decree was erroneously granted because the Government did not "furnish" any new design.

The Government admits that the only possible point of resemblance between the Davison, Dieter

and Leavitt designs was in having two counter-revolution wheels (p. 266).

In November, 1906, when the Dieter design was made, and in January, 1907, when the Davison design was made, the objective towards which both the Government and the Bliss Company were aiming was the correction of the initial roll of the torpedo. Lieutenant Davison (p. 86) thought that the initial roll might be caused by the gyroscopic action of the so-called unbalanced turbine. He accordingly made his design, which design did not consist of two turbine wheels revolving in opposite directions, but rather of an entire mechanism, in which the system of gearing formed the principal feature, so that when the power was applied, the moments of inertia in one direction would neutralize the moments of inertia in the opposite direction (p. 92). The defendant, on the other hand, placed no faith in the theory that the gyroscopic action had anything to do with the initial roll or sheer of the torpedo (p. 185). That it was right is corroborated by the fact that the sheer still continued after the installation of the Dieter design (p. 186).

At the trial, the complainant changed its theory that the initial roll was due to gyroscopic action, and advanced the theory that it was due to reaction of the gases after passing through orifices, called nozzles, and impinging on the buckets of the first stage turbine. The reaction took effect on the nozzles, on the fixed blading and on the body of the torpedo (pp. 36, 37). This theory had previously been appreciated by the defendant and overcome, not by means of a balanced turbine, but simply by changing the location of the turbine, especially of the nozzles against which the gases reacted. The

counter-revolution wheels have been retained, not to overcome any gyroscopic reaction, but because it is a more simple construction and requires one less gear. This can be perceived by a comparison of the existing type of torpedo (Ex. 27) and the model of an unbalanced turbine (Exs. 146, 146a, 146b).

The design in the existing type of torpedo was the exclusive creation of the Bliss Company (p. 193) (Leavitt Patent No. 1,088,080, pp. 545-548). It was first installed in the Mark VI torpedo and is used in the Mark VII torpedo, which is the type made under the 1912 contract (pp. 192, 193). Exhibit 27 is a specimen of the Mark VII torpedo (pp. 192-193), and the balanced turbine installed therein is expressly included within the injunction decree (p. 274).

The defendant's expert, Mr. Browne, described the Leavitt design and pointed out the following differences between it and the Davison design:

(1) In the Davison design, the plane of rotation of the turbine wheels is perpendicular to the main axis of the torpedo; whereas, in the Leavitt design, it is horizontal to that axis.

(2) In the Davison design, there are fifteen gears; whereas, in the Leavitt design, there are only eight.

(3) In the Davison design, a single shaft is driven by both turbines, the propellers being rotated in opposite directions by means of gearing; whereas, in the Leavitt design, there are two concentric shafts, one of which is driven in one direction by one turbine wheel, while the other shaft is driven in an opposite direction by the other wheel (pp. 127, 128).

The function of the present Leavitt design is entirely different from that of the Davison design. This was admitted by Commander Williams, who said that the nozzle reaction in the Davison design tended to roll the torpedo, whereas the only tendency in the Leavitt design would be to slew the torpedo around the vertical axis of the turbine (p. 46).

That the change in the location of the turbine wheels and the consequent change in the location of the nozzles obviated all tendency of the torpedo to roll, whether from gyroscopic action or nozzle reaction, was proven by the defendant's experiments. It was also proven that in their new location on an axis perpendicular to the main axis of the torpedo, it was immaterial whether the turbines revolved in the same or in opposite directions (p. 221).

After these experiments, the Bliss Company constructed an unbalanced turbine (Ex. 146), which was identical with the balanced turbine in the existing type, except that the two turbine wheels turned in the same direction, an additional gear being required to accomplish the result, and installed it in a Mark VII torpedo. In actual tests, this torpedo was run and operated, as to roll and in every other respect, in precisely the same manner as the balanced turbine (pp. 241, 242, 234-239). The only reason for using the balanced turbine is that it is a simpler construction than the unbalanced turbine (p. 220).

Not only have the characteristics of Davison's construction disappeared, but the very purpose and function of his design has disappeared. The entire case seems to resolve itself into the simple question, whether the Government is entitled to restrain

the defendant from using two turbine wheels revolving in opposite directions, which it was using when the Davison design was made; and in answering this simple question, the Government, by necessity, requests the Court to ignore entirely the mechanism devised by Davison, including the dynamic balance of its parts and the purpose and function of his device. The Government's whole case is summed up in the definition of a balanced turbine as given by its expert, Mr. Decker, after he admitted that he did not know whether the moments of inertia in the existing type of turbine were neutralized:

"The phrase 'balanced turbine' has been used throughout to designate a turbine in which two rotors are on the same axis and revolving in opposite directions; to that extent I call that a balanced turbine" (p. 69).

The complainant's witness, Commander Williams, testified positively that when he said that the balanced turbine in the existing type of torpedo was similar to the Davison design, he intended to limit the similarity simply to the fact that in each device there were two turbine wheels turning in contrary directions (p. 266).

It would indeed be a harsh injustice to restrain the appellant from using a mechanism which its chief engineer and inventor has devoted his entire life in developing and designing.

POINT VIII.

The double regulation of air was not "a device the design for which was furnished to" the Bliss Company by the Government.

Trial Judge Veeder refused to find that the double regulation of air in the existing torpedo was furnished by the Government (Rec., p. 271), and dismissed the complaint, as to that device (Rec., p. 274). In the Circuit Court of Appeals, Judge Coxe, writing for the Court, made no specific finding upon the double regulation of air, but at the end of his opinion said generally, "We are of the opinion, therefore, that the injunction should include all designs, drawings, plans and specifications used by the defendant in making the Bliss-Leavitt torpedo for the Government which were approved by the Ordnance Bureau, notice of which was given pursuant to the provisions of Clauses 19 and 20 of the contracts in question (Rec., p. 553). Upon the settlement of the decree on the mandate, Judge Veeder could not determine whether the words of Judge Coxe above quoted expressed an intention to direct an injunction as to the double regulation of air, and by letter to Judge Coxe, with approval by all counsel, he asked for an interpretation of the decision of the Appellate Court. Judge Coxe replied "that *the majority* (Judges Coxe and Rogers) is of the opinion that the devices for the compound regulation of air should be within the injunction" (Rec., pp. 579, 580). Judge Ward dissented from this ruling though not dissenting from the original opinion (pp. 549-553). The decree on

mandate was made accordingly (Rec., p. 581). Thereupon the defendant petitioned for a reargument (Rec., pp. 554-574), which was granted as to the double regulation of air (p. 574). On the reargument, Judge Coxe (with Judge Rogers concurring) upheld the decree as it had been entered; Judge Ward dissented (Rec., p. 582), and the Court declined to disturb its decree (p. 584).

The propulsive energy of the Bliss-Leavitt torpedo is in the compressed air stored in the air flask. This air is stored under very high pressure, about 2,250 pounds to the square inch (p. 125). This internal pressure, of course, diminishes as the amount of compressed air reduces. This initial pressure in the flask is dropped by means of a reducing valve to a lower pressure in the superheater, and to a much lower pressure, with high speed, at the turbine. If the flow of the jet of air upon the turbine cups is irregular, the power of the engine and the speed of the torpedo are affected.

In the earlier Mark I-VI torpedoes, a single reducing valve had been used to lower the flow of air from the flask to the superheater, and in the 1912 contract a single reducing valve had been specified for the Mark VII torpedo. Lieutenant Sawyer (Rec., pp. 112-120), who was the Navy Inspector at the Bliss Works, testified that in January, 1913, in the shop tests of the early Mark VII's, irregularity of horsepower was developed (p. 113).

On January 4, 1913, the Bureau of Ordnance wrote to the Bliss Company: "The experiments at the Torpedo Station have indicated an improvement in regulation by the use of two reducing valves, and the experience at Fiume has led the Whitehead Company to use the double regulation,

a practice which obtains with the Schneider Company also" (Rec., p. 372).

Lieutenant Sawyer says that he talked to the Bliss Company about the desirability of making the experiment which he said had been made in 1911 at the Newport Torpedo Station in 1911, namely, the use of a compound or triple reducing valve. Lieutenant Sawyer told the officers and employees of the Bliss Company that successful dynamometer tests had been made at Newport by "using two single regulators arranged in tandem or series". Lieutenant Sawyer makes no claim that any device or design was furnished by the Government. He says:

"In substance I told him (Mr. Leavitt) that the difficulty in meeting the specifications in regard to the uniformity of horse power, could in all probability be overcome by using a compound or two-stage regulator; that following the recommendations of Lieutenant Frederick, the Naval Torpedo Station at Newport had performed the experiment of using two regulators in tandem or series, with a Bliss-Leavitt Mark II torpedo, with a consequent remarkable improvement in the uniformity of the horse power, and that if they would repeat the same experiment, using two single regulators of the type in the existing torpedo, shown in Exhibit 27, they would no doubt accomplish the desired result of obtaining greater uniformity of horse power out of it" (pp. 117, 118).

Lieutenant Sawyer further testified (p. 118):

"Q. As a matter of fact you did not give him (Mr. Leavitt) any design, did you?

A. No. No design was given him so far as blue prints or written descriptions were concerned.

Q. The correspondence indicates that all you did was to give him orally the idea of using

two such regulating valves in series; that is all you told him, isn't it, about the construction?

A. Substantially the information was explaining to him the experiment above outlined."

The Bureau letter of January, 1913, above quoted (p. 372), shows that at that time the Government was not claiming to have invented or furnished any device, but was only suggesting that the Bliss Company try out whether the principle of regulation in use by Whitehead and Schneider could be used in the Bliss-Leavitt torpedo. Lieutenant Sawyer makes no claim that he did more than inform the Bliss Company that a more regular flow had been obtained at Newport by running the air through two reduction valves instead of one. There was nothing new in the idea that a more regular flow of air could be produced by the use of two valves. Patents were issued for this device as far back as 1879 (Deft.'s Ex. 110, p. 829; Deft.'s Ex. 111, p. 839). These patents are thoroughly explained by the defendant's witness, pages 130, 131. Lieutenant Sawyer concedes (p. 120) "that pressure regulating valves for reducing pressure were very common in the arts generally", and that Mr. Leavitt and Mr. Page were familiar with the state of the art. Mr. Page says "it was quite evident that a double regulator would produce a more uniform air pressure" (p. 240). But as Mr. Leavitt succinctly states, "The space was very contracted, and the problem was to make the two valves similar to the one valve, and get them into the space at our disposal, without getting too much weight" (p. 205).

The discussion was not as to whether two reduction valves would produce a more uniform flow of

air at the engine, but as to the feasibility of accomplishing the result in a Mark VII torpedo—whether in the space available an additional reduction valve could be placed, whether its weight would not require too much readjustment of parts, and whether the Bureau would stand for the changes in specifications that would be needed.

Defendant's Exhibits 137 and 138, being cross-sections of the torpedo, with single and double reduction apparatus, illustrate graphically the sizes and weights of these so-called "valves", and the difficulty of designing, adjusting and using them in the limited space, amidst a complicated mass of pipes and fine machinery.

The Bliss Company made the dynamometric tests proposed, of running the air through two single reducing valves and of course obtained a showing of a more regular flow of air at the nozzle. This appears to have been done before January 18th, 1913, as the Bureau letter of that date (Complt.'s Ex. 65, p. 373) shows. This letter reads as follows:

"1. The Bureau is pleased to note the decided improvement shown in the dynamometer tests of the Mark VII torpedo by the use of double regulating valves.

2. *This plan or idea of double regulation* was first submitted to the Bureau by a letter from Lieut. E. Frederick, then Assistant Inspector of Ordnance at your works, dated March 9, 1911, which was received and filed in this office on or about March 15, 1911, and the value of the invention was successfully established by the actual tests at the Naval Torpedo Station, Newport, R. I.

3. The Bliss Company had been *furnished verbally with the idea* and the fact that its value had been established by actual trials. This was also furnished the E. W. Bliss

Company by the Bureau's letter No. 25698/92 (G) of January 4, 1913.

4. In view of the above the Bureau requests that you will note for record that the *double regulating principle* has been submitted by the Bureau, and that this principle of any device embodying the same falls under the provisions of Clause 20 of the contracts now existing.

5. While *the Bureau has no actual blue prints of design* it has on record cards and certain data obtained by experiments at the Torpedo Station which the Bureau will be pleased to furnish to E. W. Bliss Company for their information if they so desire and will request it.

6. The Bureau again desires to express its pleasure in noting the improvement in the dynamometer tests due to the double regulation and the change in angle spray which was introduced at the suggestion of the Bureau's inspectors at your works."

The foregoing letter is conclusive that the Government had furnished no "blue prints of design" and that it claimed to have done nothing more than to have suggested the "plan or idea of double regulation", that it had "furnished verbally with the idea", and that it was the "double regulation principle" that had been suggested. Indeed this is admitted by its counsel (p. 113).

Mr. Dieter, the Chief Draftsman of the Bliss Company (p. 152), with the advice of Mr. Leavitt as to details (p. 204), then "designed the arrangement of valves that was afterwards introduced into the Mark VII torpedo" (shown in Defendant's Exhibit 138).

On February 17, 1913, Mr. Page wrote to the Bureau the following significant letter (p. 376) :

"We desire to inform the Bureau that we have after much time and consideration, been

able to design a double pressure regulating device, which is possible of installing in the 18-inch torpedo without necessitating changes in any of the existing parts, other than the valve group.

We have this double regulator device in course of construction at the present time and expect, barring unforeseen delays, to have same ready for inspection by the Bureau's inspectors in a few days.

We would also add that while the present type meets, in our judgment, the conditions of the specifications, we have at the same time discontinued work on the single regulating devices in order that, should the Bureau decide to have the double regulator installed, the additional cost will not be more than necessary as we have already a large number of the single regulators finished or under way and the work on the contract will not be delayed through our holding up the work at the present time on these single regulators, pending the decision by the Bureau in connection with the matter.

The great difficulty of course has been to so design the double regulator that it could be installed in the 18-inch torpedo and being so designed, it is of course applicable to the large size of torpedo."

On the following day, February 18th, Mr. Page wrote further to the Bureau, as follows (p. 376) :

"We are in receipt of the Bureau's letter of January 18, 1913, concerning a 'plan or idea of double regulations', and stating that this idea has been furnished to us verbally, and requesting us to note that this 'double regulating' principle falls under the provisions of Clause 20 of the contracts now existing.

We beg to inform the Bureau that we cannot accept the Bureau's interpretation of Clause 20 of said contracts.

In our view of Clause 20 it applies only to

'any device' the design for which is furnished to us by the Bureau. We especially direct the Bureau's attention to the proviso of Clause 20 that 'no device or design shall be considered as coming within the provisions of this clause unless the Bureau shall state to us in writing at the time when the said device is itself conveyed to us, that the Bureau considers that the said device or design is expressed within the provisions of this clause.

We regard it as perfectly clear from the language of the contract that it has no application to mere intangible ideas or principles, and that it applies solely to a device embodied either in a model, or in a working drawing constituting a design illustrating such device. Furthermore we regard it as necessarily implied by the language of the contract that the device or design to be furnished to us by the Bureau in order to be covered by said clause must be one of which we are not already in possession, and must be something essentially novel, since obviously to include matters of common knowledge or ordinary shop expedients, would be contrary to the spirit of the contract. It clearly was not intended that this clause should entitle the Bureau to notify us of things already known or used, or of mere intangible ideas and thereby to put us under any restriction concerning such things. In our view the intent of the clause in question was that in the event that the Bureau should at any time work out any new improvement and embody it either in an operative device or in a drawing or design of such device, and should communicate it to us, that such device or design should be within the prohibition of Clause 20th, if the proviso giving us notice thereof was also complied with. Any interpretation obligating us beyond this we cannot accept.

In our view the matter communicated in the Bureau's letter of January 18, 1913, does not come within the provisions of Clause 20."

The last foregoing letter states exactly the position which the defendant took then and takes now.

Judge Coxe, in his opinion on the reargument (p. 974), seems to us to have not only misunderstood the case but to have undertaken to expunge from Clause 20 of the contract the very clause that was deliberately placed therein for the benefit of the Bliss Company against the operation of the contract upon mere principles and ideas, and requiring an actual design of a device to be furnished.

In the first place, Judge Coxe seems to assume that the change required was the mere adding of an ordinary valve. He says: "Briefly the situation was practically this—the Bureau officers said to the Bliss Co.'s officers 'you need another valve; put it here'—indicating the place on the drawing or model where the second valve was to be inserted. This was done with the result that the defect was remedied." The fact is that the so-called "valve", whether single or double, is a piece of large, heavy and complicated machinery. Even with the most careful designing it added 4½ pounds to the weight, took important space and required considerable readjustment of machinery.

The letter on which the injunction decree is based (p. 573) demonstrates from the Government's own archives that all it furnished to the defendant was a suggestion or idea as to which the correspondence plainly shows was not to be included within the restrictive clause. As we have previously pointed out, the parties came to a clear understanding of the subject-matter of the restrictive clause and what was intended thereby before the contract was formally prepared. On October 16, 1905, the Government wrote:

"The situation being as above set forth, the Bureau now intends to use the skill and ex-

perience of its officers and others,—and to expend a certain amount of money in perfecting certain features of the torpedo. While it is desirous of doing this, and of giving you the benefits of its discoveries, should any of value be made, in order that you may use them in filling contracts entered into between you and the United States Government, at the same time it would not be right for you to make use of knowledge thus gained at the expense of the United States and by work of its officers * * *” (p. 314).

The E. W. Bliss Company on October 19, 1905, said in its reply to the Government:

“We believe, however, that the Bureau will agree with us that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the suggestion of a possible improvement is made by the Bureau and worked out by us” (p. 315).

The Government on October 21, 1905 (p. 316), acquiescing in this suggestion on the part of the E. W. Bliss Company, said:

“1. The Bureau desired to express originally the statement made by you that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the suggestion of a possible improvement is made by the Bureau and worked out by you.”

This correspondence read in connection with the proposed draft of clause 19th, submitted by the Government, providing for the furnishing to the defendant of all possible information, device and suggestions, which was declined by the Bliss Company (see p. 30 of this brief), clearly demonstrates that it was never intended that a device designed

by the defendant, such as the device of double regulation of air, should be within the restrictive clause. Our discussion as to what is to be included in a device the design for which is furnished by the Government under Point II is forcefully applicable here.

Even though the word "design" does not refer to something concrete, it at least imports something as to dimensions, size, shape, weight, etc., from which a device could be constructed. There is not a syllable of evidence giving any particulars regarding a design for a double air regulator to meet the prescribed conditions as to space, weight, etc., in the torpedo. Plaintiff's counsel expressly admitted upon the trial that no written notice as prescribed by the contract was served of any design, but that the Government relied upon a verbal communication to the defendant (p. 113).

The complaint should have been dismissed as to the device for double regulation of air.

POINT IX.

The superheater device furnished by the Government is now obsolete. The defendant has never threatened or intended to disclose such device. It is not contained in the existing type of torpedo.

There exists no issue between the parties concerning the inside superheater device. The defendant has freely admitted that the Government suggested a certain modification of the superheater used in torpedoes manufactured under the 1905 contract,

but denies that this forms any part of the existing type of torpedo.

The Trial Court found that the Government conveyed to the defendant with the notice required by the contract, an improvement in the inside superheater, as specified in Exhibits 54 to 57, inclusive, dated September 18, 1906. The Trial Court found, however, that this device was not embodied in the existing type of torpedo (p. 271).

The record is entirely devoid of any evidence that the defendant ever threatened to disclose anything, except what is contained in the existing type of torpedo (Ex. 5).

The device communicated by the Government was a minute detail pertaining solely to the inside type of superheater, in which alcohol was injected into the main body of the air flask itself and ignited at the moment of firing (p. 84). The change from the inside superheater to the outside superheater was made in 1907. Since then no torpedoes have been made with the inside superheater, and it is now obsolete (pp. 84, 85).

The Government's witness McCormick testified that the device claimed by the complainant is no longer used, and that it is no part of the existing type of torpedo (p. 98). This was further corroborated by Government witness Norton (p. 101). Counsel for the complainant freely admitted that the construction of the complainant's design is now obsolete and forms no part of the existing type of torpedo (p. 98). The claim of the complainant is solely that it is entitled to an injunction restraining the use of this type at any future time. It is no part of the office of the writ of injunction to enjoin an act at a future time which is not threatened and upon which there is no ground of belief that the act will ever be done or performed.

POINT X.

The three-ball bearing design furnished by the Government is not used in the existing type of torpedo. The defendant has not and never threatened or intended to disclose it.

The appellee admittedly disclosed a particular design for ball bearings with proper form of notice under the contract. This design forms no part of the existing torpedo. The Trial Court found (p. 271) that a ball bearing device was disclosed by the Government to the defendant, but did not find that this device is embodied in the existing torpedo, and decreed accordingly. It will, of course, be conceded that ball bearings have been used for various purposes from time immemorial.

In the ball bearing art, there are two distinct types of bearings, viz.:

(1) The full type, where the balls entirely fill the race track.

(2) The spaced bearing, where the balls are separated by a cage or spacer (pp. 128, 129, 197, 198).

The gyro of the Whitehead torpedo had ball bearings. The construction of this bearing is shown in the Obry patent of May 1, 1900 (Deft.'s Ex. 108, p. 478). The Whitehead bearing was of the full type (using no cage or spacer), the balls bearing at one point on the outside raceway. The Bliss Company manufactured the Whitehead gyro-scope of this construction (pp. 199, 200).

The Bliss Company also manufactured a Leavitt

gyroscope with ball bearings of the construction shown in exhibit 109 (p. 480). This also was a full ball bearing. It was used in the Mark IV torpedo, which was made prior to the submission of the naval design (pp. 200, 201). The naval design was submitted by letter of March 31, 1906, and accompanying blue prints (p. 323, Ex. 51; pp. 719-721, Exs. 52, 53).

The distinctive features of this naval design are:

(1) The use of only three balls, thereby producing a three point bearing analogous to the action of a three-legged stool.

(2) The use of a spacer or retainer for holding the balls in their correct positions.

The defendant has never questioned that this design was the Government's property. The use of this bearing was abandoned when the defendant started to build the Mark VI torpedo (pp. 197, 198). The present bearing used in the Mark VI and Mark VII torpedoes is shown on exhibit 107. This is the Leavitt design. It is a full ball bearing, having six balls in contact (pp. 197, 198).

The naval design is radically different from both the Whitehead and Leavitt full ball bearings.

It cannot be that the Government will pretend that by communicating a specific design in March, 1906, it could thereby deprive the defendant of its right to use the previous type of full ball bearing which it had manufactured in both the Whitehead and Leavitt gyros. The present bearing is substantially a reproduction of those bearings, the manufacture of which was and is clearly within the defendant's right.

The naval design of bearing not having been any part of the existing type of torpedo referred to in

the defendant's letter of May 9, 1913, is not included in the notice contained in that letter of the defendant's intention to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo (p. 379).

The defendant has always maintained secrecy as to this naval design. There is absolutely no proof that it has never threatened to divulge this secret, or to make the device for others than the complainant. It has no intention of violating its covenant contained in article 19th of the 1905 contract concerning this device in any way. Hence, no cause of action has arisen as to this device, and the complaint should have been dismissed for the reasons stated in our previous point, as it was by the decree of the District Court.

POINT XI.

The injunction decree should be vacated and the complaint dismissed, with costs.

Respectfully submitted,

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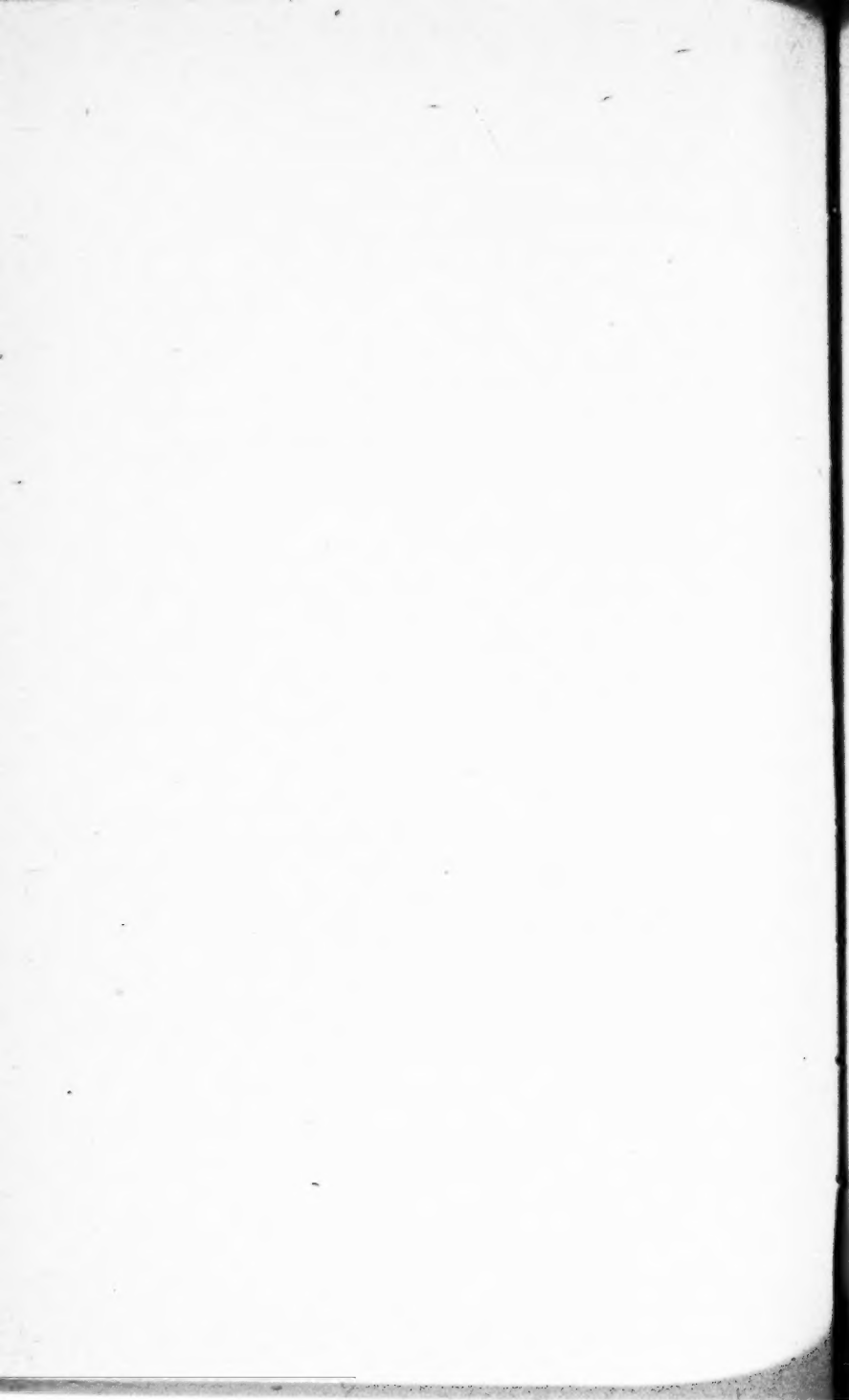
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In the Supreme Court of the United States.

OCTOBER TERM, 1918.

No. 15.

E. W. BLISS COMPANY, APPELLANT,

v.

THE UNITED STATES.

No. 16.

THE UNITED STATES, APPELLANT,

v.

E. W. BLISS COMPANY.

*APPEALS FROM THE UNITED STATES CIRCUIT COURT OF
APPEALS FOR THE SECOND CIRCUIT.*

BRIEF FOR THE UNITED STATES.

STATEMENT OF THE CASE.

INTRODUCTION.

These are cross appeals from a decree of the Circuit Court of Appeals for the Second Circuit granting in part and dismissing in part a suit by the United States to enjoin the E. W. Bliss Company, defendant, from disclosing or exhibiting to the

representatives of the Whitehead Torpedo Company of England or others torpedoes containing devices the designs for which were furnished to the Bliss Company by the Bureau of Ordnance of the Navy Department. (R. 1, 13.) The appeal of the Government will not be pressed.

Prior to 1901 defendant manufactured in limited quantities so-called "Whitehead" torpedoes for the United States Navy. (Page, R. 123; Leavitt, R. 170.) This type of torpedo was first developed by the Whitehead Torpedo Company of Fiume, Hungary, and was described by Leavitt, defendant's engineer and chief witness, as an instrument of "short range and low power." (R. 170, 254.)

In 1905 defendant began manufacturing torpedoes for the United States under a contract which contemplated that defendant's engineers, in collaboration with the experts of the Bureau of Ordnance, should develop a torpedo of greater speed, range and accuracy than any then in use. (R. 379-412.)

As part of this arrangement it was agreed that devices the designs for which were communicated to defendant by the officers of the Bureau should not be used in the manufacture of torpedoes for others than the Government of the United States, nor described or exhibited to others. (R. 379, 386.)

After much experimenting on the part of both the Government's and defendant's engineers, and the expenditure of substantial sums of money by the Government, a most efficient torpedo was developed. (Page, R. 123.) This torpedo differed from the

Whitehead torpedo in numerous details of construction, but mainly in that it was propelled by a balanced turbine engine, whereas the latter was propelled by an engine of the reciprocating type. (Page, R. 123.)

Because of the superior speed, range and power of this new weapon, other nations have been eager to learn the secrets of its construction.

On May 9, 1913, defendant served notice upon the Government of its intention to communicate to the Whitehead Torpedo Company of England the complete construction and operation of this torpedo (R. 378-379),¹ a number of the essential features of which—including the balanced turbine and the compound air regulator—were communicated to defendant under the protection of the above mentioned agreement. Whereupon, this suit was brought to restrain the threatened breach of the agreement.

THE UNBALANCED TURBINE.

It will assist to an understanding of the situation regarding the *balanced* turbine—the principal device here in dispute—to state briefly the history of the device which preceded it—the *unbalanced* turbine.

On October 12, 1901, Lieutenant-Commander B. A. Fisk, U. S. N., then inspector of ordnance at defend-

¹ In a letter to the Bureau dated May 9, 1913, defendant said: "We notify you hereby that it is our intention to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo, and to make a demonstration of the operation of said torpedo to a representative of Messrs. Whitehead & Company on or immediately after June 1, 1913.

"This notification on our part will afford your department the necessary evidence on which, if you regard our proposed action as a breach of contract, to apply to the United States District Court having jurisdiction to enjoin us from such threatened action." (R. 378-379.)

ant's works, wrote the Chief of the Bureau of Ordnance that in conversation with Frank M. Leavitt, defendant's chief engineer, he had expressed the wish that Leavitt would design some plan for adapting the turbine to the torpedo, but that Leavitt could think of no proposition which would be attractive to the Bureau, for the reason that "no one knew enough about the action of compressed air on turbines to give any guaranty." (R. 289.)

Enclosed with Commander Fisk's letter was a communication from Leavitt, written subsequent to this conversation, stating that in his judgment it would be unwise to build a turbine torpedo "until the question of the efficiency and adaptability of the turbine has been more fully tested," and suggesting that a proper course would be to construct an experimental turbine and subject it to thorough tests with the dynamometer. He added that he thought defendant would be justified in accepting an order for such an experimental turbine at \$3,000. (R. 288.)

On October 14, 1901, Commander Fisk, by direction of the Chief of the Bureau of Ordnance, obtained from defendant a proposition the essential part of which is as follows:

We will agree to design and construct a turbine, in accordance with the details given in the Bureau's letter above referred to, and make exhaustive dynametric tests, *at the conclusion of which the apparatus and all data are to be the property of the Bureau.* Our charge for this work will be three thousand (\$3,000) dollars. (R. 291.) [Italics ours.]

This proposition was accepted by the Bureau on October 21, 1901 (R. 291), and by the following Spring defendant had built an unbalanced turbine of the Curtis type—i. e., a turbine with two stages or discs revolving in the same direction—of appropriate size and design for use in a torpedo. (R. 292-295.) Dynamometric tests of this engine were had at defendant's works in the presence of Lieutenant G. C. Davison, U. S. N., who on April 16, 1902, made a full report to the Bureau of Ordnance, concluding with the recommendation that the turbine be installed in a torpedo and given service runs as a final test.¹ (R. 292-296.)

The Bliss Company continued its experiments throughout the following year and on September 15, 1903, invited the Bureau to send a board of officers to Sag Harbor to witness the tests of a new torpedo, called the Bliss-Leavitt torpedo, which had been developed. (R. 296-298.) This invitation was accepted and the new torpedo was subjected to numerous tests both at Sag Harbor and at Newport in the presence of the Torpedo Board. The engine contained in this projectile is described as an unbalanced turbine of the Curtis type closely resembling the experimental turbine which had been built for the Bureau. (Leavitt, R. 206;

¹ This experimental turbine, which under the agreement became the property of the Bureau, was sent to the Naval Torpedo Station at Newport, Rhode Island, to be fitted in a torpedo in accordance with Lieutenant Davison's recommendation. (R. 180, 296-297.) Interest was diverted from this turbine by the appearance the following year of the Bliss Company's new torpedo, and it does not appear whether it was ever installed.

Report of Board, R. 299-300.) The Torpedo Board in its report expressed itself as most favorably impressed with the performance of the torpedo (R. 308-309),¹ and sometime during the following year (1904) fifty 18-inch and two 21-inch torpedoes were ordered from the company, which were designated Bliss-Leavitt Mark III torpedoes. (Leavitt, R. 183, 207.)

FAILURE OF UNBALANCED TURBINE.

Despite the promising performances in 1902 and 1903, as recorded in the reports of Lieutenant Davison and of the Torpedo Board, the unbalanced turbine subsequently proved to be inefficient and unsatisfactory as a means of propelling torpedoes.

During the service tests of the fifty 18-inch torpedoes ordered in 1904, and the first of the torpedoes built under the contract of November 22, 1905 (see *infra*, p. 11), it was noted that the torpedo developed a distinct roll or heel when first discharged from the tube and while the turbine was being accel-

¹ This report is significant chiefly for the reason that in it was mentioned for the first time in connection with the work of the Bliss Company for the Government the device of the balanced turbine—i. e., a turbine in which the two stages or discs revolve at equal speeds in opposite directions. In considering the possible disadvantages of the unbalanced turbine for torpedo propulsion, it had been suggested that the gyroscopic action of the discs—turbines—might affect the accuracy of the shot, and the Board paid particular attention to this feature of the tests, reporting as follows:

" * * * Apparently the gyroscopic energy of the turbine did not disturb the accuracy. It is impossible to say whether any greater disturbance would be produced during a curved run with wide angle fire, as the gears as at present arranged would not permit of such a run. If, however, in future trials such a disturbance should be experienced, a *feasible and practicable remedy* would be to substitute for the one turbine a pair of twin turbines revolving in opposite directions, geared together and to the main shaft." (R. 305.) [Italics ours.]

erated. The "initial roll" thus recognized caused the torpedo upon striking the water to sheer sharply to the right and then to roll from side to side in its course, thereby destroying the accuracy of the shot and incidentally diminishing the speed and range of the torpedo. (Williams, R. 39-40, 78; Davison, R. 86-87; Leavitt, R. 183-185.)

The erratic performance of these early torpedoes is admitted by Leavitt, defendant's chief engineer, who testified as follows:

Q. When you first tested the 18-inch torpedoes made under that first contract, at Sag Harbor, did you have any trouble with the sheer?

A. I remember that the first few shots we did not; then it commenced to develop; we had trouble ever after for a long time. (R. 184.)

There is a conflict of opinion as to the cause of the initial roll and sheer, the naval officers maintaining that it was due to the gyroscopic action of the unbalanced turbine, and defendant's witnesses contending that it was due to certain other mechanical imperfections in the torpedoes. (*Infra*, pp. 43-44n.) However that may be (and the question has no relevancy in this case), the torpedoes containing the unbalanced turbines were subsequently withdrawn from service by the Navy Department and fitted with the balanced form of turbine, which had in the meantime been invented by Lieutenant Davison. (Williams, R. 259-260.)

Although as aforesaid the first unbalanced turbine was built at the suggestion of Commander Fisk at Government expense and upon completion became the property of the Bureau of Ordnance, the Government made no claim to the control of this type of engine, but on the contrary expressly conceded to defendant the right to manufacture for anybody torpedoes containing it. (R. 314.)

NEGOTIATIONS LEADING UP TO CONTRACT OF 1905.

In 1905 the expanding naval program of the United States necessitated increased supplies of torpedoes. Accordingly negotiations were opened with defendant for the manufacture of a large number of torpedoes of the then existing type. It was in these negotiations that the Government first took the position that all devices and improvements suggested by its officers and experts should be used only in torpedoes built for it. In a letter to defendant dated October 16, 1905, the Bureau of Ordnance outlined its position as follows:

The Bureau now intends to use the skill and experience of its officers and others, and to expend a certain amount of money in perfecting certain features of the torpedo. While it is desirous of doing this, and of giving you the benefits of its discoveries, should any of value be made, in order that you may use them in filling contracts entered into between you and the United States Government, at the same time it would not be right for you to make use of knowledge thus gained at the ex-

pense of the United States and the work of its officers to benefit foreign governments, possible adversaries of the United States in time of war, or for the financial or other gain of the Bliss Co.

* * * * *

It seems to the Bureau that it might be possible to so far frame a clause in the contract as to guarantee to you the use of all knowledge and experience gained by the Bureau, provided that you in turn guarantee that such knowledge and experience shall be used only in fulfilling contracts with the Bureau. (R. 314.)

On October 19, 1905, defendant addressed a reply to the Bureau of Ordnance concurring in this view, and suggesting an obviously appropriate limitation upon the scope of the proposed Protective Clause. Because of its bearing upon the interpretation of the contract subsequently entered into the letter is here set out in full:

In reply to your letter No. 17761/43 of the 16th instant, we beg to say that we fully appreciate the justice of the position taken by the Bureau, and we shall always hold as strictly confidential, and as the sole property of the Bureau, any improvements in the torpedo suggested by it.

We believe, however, that the Bureau will agree with us that such confidential matters may properly be confined to concrete improvements developed by the Bureau, and not necessarily include matters where the sug-

gestion of a possible improvement is made by the Bureau and worked out by us.

As this is a very important matter, and as we wish to be very careful not to divulge anything which the Bureau considers its private property, and to have no misunderstanding as to where the line shall be drawn, we mention the following as an illustration of our position.

The Bureau found fault with our starting mechanism and wanted something simpler and requiring less attention. If the Bureau had suggested the use of a breaking tube, this device would clearly have been its sole property. But as a matter of fact, although it was the Bureau's suggestion that a simpler device be substituted, as we have worked out the manner of its accomplishment, we feel it to be our property. (R. 315-316.)

On October 21, 1905, the Bureau wrote to defendant accepting this limitation and enclosing a proposed Clause Nineteenth to be inserted in the contract to carry out the intention. (R. 316-318.) In reply defendant suggested that the clause be amended so as to apply only to such improvements as should from time to time be mutually agreed upon. (R. 319.) This proposal was rejected (R. 319-320), and finally it was agreed that the Government should designate in writing such devices as in its opinion came within the operation of the clause, and that such designation would be binding upon defendant. (R. 320-321, 386, *infra*, pp. 11-12.)

CONTRACT OF 1905 AND SUBSEQUENT CONTRACTS.

As a result of the foregoing negotiations on November 22, 1905, a contract was entered into between defendant and the Government (represented by the Chief of the Bureau of Ordnance) for the manufacture of three hundred Bliss-Leavitt 5-meter, 21-inch, Mark I torpedoes at an aggregate cost of \$2,130,000. (R. 379-387.) The torpedoes were to be constructed in conformity with specifications approved by the Bureau, which required, among other things, a range of 3,500 yards at a speed of 26 knots. (R. 339-340.) Clause Nineteenth of the contract, herein referred to as the Protective Clause, reads as follows:

It is hereby expressly further stipulated, covenanted, and agreed, that the party of the first part (the Bliss Company) will not make use of any device the design for which is furnished to it by the party of the second part (the Government) in any torpedo constructed or to be constructed for any person or persons, firms, corporations, or others, or for other governments than the party of the second part hereto; that the party of the first part will not exhibit such device or in any way describe it to or give any information in regard to it to any person or persons, firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto; that the party of the first part will not exhibit the performance of any torpedo containing such device, either in shop or in service tests, to any person or persons,

firms, corporations, or others, or to other governments, or their representatives, than the party of the second part hereto;¹ . . . Provided, furthermore, that no device or design shall be considered as coming within the provisions of this clause unless the party of the second part shall state to the party of the first part in writing, at the time when said device or design is itself conveyed to the party of the first part by written communication from the party of the second part, that the party of the second part considers that the said device or design is embraced within the provisions of this clause. (R. 386.)

Subsequently eight other contracts were entered into by and between defendant and the Government for the manufacture and delivery of torpedoes, as follows:

April 20, 1909, for 42 torpedoes;

June 16, 1909, for 60 torpedoes;

¹ Penalties for breach of these covenants are prescribed as follows: "That in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improvements, without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods, or ideas, or other features invented and communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared materials therefor, on account of which payment in any amount shall have been made under this contract, shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract." (R. 386.)

October 22, 1909, for 100 torpedoes;
July 27, 1910, for 24 torpedoes;
December 24, 1910, for 32 torpedoes;
December 24, 1910, for 50 torpedoes;
June 12, 1912, for 120 torpedoes;
May 9, 1913, number of torpedoes not given.
(R. 137.)

Each of these contracts contained a clause reading substantially the same as the Clause Nineteenth of the contract of 1905. (R. 137.) In all contracts prior to the contract of 1912 this provision was known as Clause Nineteenth, but in the contracts of 1912 and 1913 it was known as Clause Twentieth. (R. 137, 386, 389-390.) In addition, the contracts of 1912 and 1913 contained the following provision emphasizing the confidential nature of the relationship of the parties:

Second. The manufacture of said torpedoes (the word "torpedoes" as used throughout this contract being intended to include everything covered by the drawings, plans, and specifications above referred to) shall conform in all respects to and with said drawings, plans and specifications, including duly authorized changes therein, but said drawings, plans, and specifications are not hereto annexed or made a part hereof. *They contain information of a confidential character that can not be made public without detriment to the Government's and the contractor's interests, and they are to be treated as confidential by the parties to this contract, it being understood, however,*

that nothing in this clause shall be construed as depriving the party of the first part of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth (the secrecy clause) of this contract. (R. 388-389.) [Italics ours.]

PROCEEDINGS IN THE LOWER COURTS.

On May 27, 1913, having been theretofore notified of defendant's intention "to communicate the complete construction and operation of the existing type of Bliss-Leavitt torpedo . . . to a representative of Messrs. Whitehead and Company" (R. 378-379), the Government filed a petition in the United States District Court at Brooklyn, N. Y., alleging that since the execution of the contract of 1905 the designs for four devices used in the existing type of Bliss-Leavitt torpedo, namely, (a) balanced turbine, (b) compound air regulator, (c) ball-bearings for gyroscope, and (d) inside superheater, had been communicated to defendant together with the written notice required by the Protective Clause. The petition further alleged that during the same period six additional devices, designs, and improvements had been communicated to defendant but without the notice prescribed in the contracts.¹

¹ These were: (a) Changes in the location and area of vertical rudders, (b) changes in the method of starting torpedoes, (c) changes in the type of depth engine, (d) changes in the curved fire gyroscope, (e) changes in the outside superheater, and (f) changes in the afterbody of the torpedo. (R. 1-8.)

An injunction against the threatened disclosure of the four first-mentioned devices was asked under the terms of the several contracts, and relief against the disclosure of the six additional devices, designs and improvements was prayed under the contracts and under the National Defense Act of March 3, 1911, 36 Stat. 1084. (R. 1-8.)

The District Court (Judge Veeder) held, in substance, that relief could only be awarded under the contracts, the National Defense Act being a criminal statute and therefore not enforceable in equity. (R. 267-272.) On the evidence the court found that designs for the following devices, namely, (a) balanced turbine, (b) ball-bearings for gyroscope, and (c) inside superheater, had been communicated to defendant in the manner prescribed in the contracts, and that of these devices one, the balanced turbine, was embodied in the existing type of torpedo. (R. 271.) The court entered a decree enjoining defendant from disclosing in any manner the design or construction of the balanced turbine, and dismissing the petition as to all other devices. (R. 273-274.)

Cross appeals were taken to the Circuit Court of Appeals for the Second Circuit, which held (Judges Coxe, Ward and Rogers concurring) that the injunction should be enlarged to include all devices the designs for which were furnished to defendant and of which notice was given in the manner prescribed in the contracts, and the case was remanded to the

District Court with instructions to that effect. (R. 549-553.) Thereafter a decree was entered by the District Court enjoining defendant from disclosing or exhibiting any torpedo containing (a) the balanced turbine, (b) compound air regulator, (c) ball-bearings for gyroscope, or (d) improvements in the inside superheater. (R. 571-574.)

The Circuit Court of Appeals agreed with the District Court that the six additional devices should not be included in the decree, since the required notices not having been given, no relief could be awarded under the Protective Clause of the contract, while the National Defense Act, being a criminal statute, could not be enforced in this proceeding. (R. 549.)

A motion by defendant for a rehearing on the question of including the compound air regulator in the injunction was granted, and after further argument the Circuit Court of Appeals (Judges Coxe and Rogers concurring and Judge Ward dissenting) filed a supplemental opinion confirming its former opinion as to that device. (R. 582-584.)

The defendant thereupon appealed to this Court. The Government also appealed because of the refusal of the lower courts to include in their decree the six additional devices above referred to. The Government, however, as before stated, does not press its appeal.

ARGUMENT.¹

I.

A DEVICE COMES WITHIN THE TERMS OF THE PROTECTIVE CLAUSE WHEN A DESIGN THEREFOR IS FURNISHED TO DEFENDANT BY THE GOVERNMENT TOGETHER WITH WRITTEN NOTICE THAT THE GOVERNMENT CONSIDERS THE DEVICE AS COMING WITHIN THE CLAUSE; ASSUMING, OF COURSE, THAT THE DEVICE IS NOT THE PROPERTY OF DEFENDANT NOR OTHERWISE RIGHTFULLY IN USE BY IT.

The essential language of the Protective Clause is "that the party of the first part [the defendant] will not make use of any device the design for which

¹ No question having been raised as to the power of a court of equity to enter the injunction in this case, it is of course unnecessary to argue the point in this brief. It may be stated, however, that the injunction was awarded in pursuance of the general equitable jurisdiction to enjoin the breach of negative contracts. This branch of the equitable jurisdiction is substantially coincident with the jurisdiction to compel the specific performance of affirmative contracts, both being governed by the same rules and subject to the same limitations. In general it may be said that a court of equity will enjoin the breach of a negative contract in every case in which it would decree a specific performance of an affirmative contract, the test in both instances being the inadequacy of the legal remedy of damages. (*Pomeroy, Equity Jurisprudence*, 3rd Ed., secs. 1341, 1344; *Bispham, Principles of Equity*, 9th Ed., secs. 461, 462; *High on Injunctions*, 4th Ed., sec. 1134.)

This branch of the equitable jurisdiction is peculiarly applicable to cases of threatened breach of contracts involving confidence and secrecy, for the reason that in cases of that kind there can not in the nature of things be an adequate remedy at law. The owner of a secret device or process has in the secret a species of property which can only be protected by injunction; for once the secret is divulged its value is destroyed for all time and an irreparable injury has been done. Because of the manifest inadequacy of the legal remedy of damages in cases of this kind, the jurisdiction of equity to enjoin the violation of contracts of secrecy—whether the contract be express or implied from the relation of the parties—is firmly established and has been often applied. (*High on Injunctions*, 4th Ed., secs. 19, 984, 1108; *Story, Equity Jurisprudence*, 10th Ed., sec. 952; *Bispham, Principles of Equity*, 9th Ed., sec. 427.)

Cases illustrating the application of this principle are cited *infra* pp. 50-53.

is furnished to it by the party of the second part" [the United States] in the construction of torpedoes for others than the Government of the United States; nor exhibit or describe to others any such device; nor exhibit or describe to others any torpedo containing any such device: *Provided; however,* that no device or design shall be deemed within the operation of the Protective Clause unless at the time it was furnished the Government gave written notice to the defendant that it considered the design or device as coming within the Clause.¹

Of course, communicating to the defendant a design for a device which it already owned or which it was already rightfully using, as patentee or otherwise, would not be "furnishing" it with a device in any sense of the word.

On the other hand, in order to come within the operation of the Clause the device does not have to be original, i. e., patentable.. There is nothing in the Clause itself to that effect, and in view of the careful consideration which its language received we are entitled to presume that if the parties had intended the application of the Clause to turn upon the originality or patentability of the device furnished they would have said so.

It follows that a device comes within the operation of the Protective Clause when these three facts are established:

First, that a design of the device was furnished to the defendant by the Government.

¹ The full text of the Protective Clause has been given above. (P. 11.)

Second, that at the time the design was furnished written notice was given to the defendant that the Government considered the device as coming within the Protective Clause.

Third, that the device was not already the property of the defendant or otherwise rightfully in use by it.

No device falling within this category can be used by the defendant in the construction of torpedoes for others than the Government of the United States, or exhibited or described to others than the Government of the United States, without violating the terms of the Protective Clause.

II.

DESIGNS OF THE FOUR DEVICES EMBRACED IN THE DECREE, NAMELY, (a) BALANCED TURBINE, (b) COMPOUND OR DOUBLE REGULATOR OF AIR, (c) BALL BEARINGS FOR THE GYROSCOPE, and (d) IMPROVED INSIDE SUPER-HEATER, WERE FURNISHED TO DEFENDANT BY THE GOVERNMENT TOGETHER WITH THE REQUIRED WRITTEN NOTICE. NONE OF THE DEVICES THE DESIGNS FOR WHICH WERE SO FURNISHED WAS THE PROPERTY OF OR OTHERWISE RIGHTFULLY IN USE BY DEFENDANT AT THE TIME.

(a) *Balanced turbine.*—A balanced turbine, as the term is here employed, may be described as an engine for the propulsion of torpedoes, consisting of two counter-rotating turbines, geared together so as to insure exact uniformity of speed, and with proper proportioning of weights and dimensions. (Williams, R. 36; Decker, R. 66; Davison patent, R. 431; Leavitt patent, R. 545.) The advantage of the balanced over the unbalanced type is that in the former the gyroscopic action of the one turbine is neutralized by that of the other, thus eliminating the heel or sheer which destroyed the accuracy of the unbalanced turbine torpedoes. (Williams, R. 36-37; Davison, R. 85-87; Davison patent, R. 431.)

On January 10, 1907, the Bureau of Ordnance, through the inspector of ordnance at defendant's plant, furnished defendant with a design of the balanced turbine, together with a written notice to the effect that the device was considered to come within

the Protective Clause of the contract. (McCormick, R. 25-35; O'Brien, R. 57-64; Notice, R. 334; Blueprint, R. 430; *infra*, pp. 32-36.)

Not only is it clear upon the evidence that the balanced turbine was not then the property of or rightfully in use by defendant, but it affirmatively appears that the device was invented by Lieutenant G. C. Davison, one of the officers of the Bureau of Ordnance. (Davison, R. 85-87; Op. Dist. Ct., R. 271; Op. Cir. Ct. App., R. 552.)

Lieutenant Davison, then assistant inspector of ordnance at defendant's torpedo station at Sag Harbor, witnessed the tests in October 1905 of the first of the Mark III torpedoes. (Davison, R. 85-86.) It was at these tests that the torpedoes first developed the objectionable sheer which has been heretofore described. (*Supra*, pp. 6-8.) Mr. Frank Leavitt, defendant's chief engineer, who claims to be the inventor of the existing type of torpedo (R. 170), testified that at that time he was "utterly at sea" as to the cause of this sheer. (R. 185.) Lieutenant Davison, however, conceived that it was due to the gyroscopic action of the single turbine, and that it might be remedied by providing two turbines of like weight and dimensions which should rotate at the same speed in opposite directions, so that the gyroscopic energy of the one would neutralize that of the other. (Davison, R. 85-86.)

Returning upon the completion of the tests to the Naval Torpedo Station at Newport, Lieutenant Davison began a series of experiments to test his

theory concerning the cause and prevention of the sheer. (Davison, R. 85-86.) The first experiment consisted in fitting a Mark III torpedo with a weight on one of the propellers so arranged that it would revolve in a direction opposite to that of the turbine. The torpedo was then suspended by ball bearings from the nose, and the engine was accelerated to determine whether a weight revolving in the opposite direction from the turbine would neutralize the gyroscopic action of the turbine and thereby eliminate the initial roll of the torpedo. (Davison, R. 86-92.)

Concerning the result of this experiment Davison testified as follows:

. . . It was demonstrated that by having weights revolving in opposite directions with the proper proportions of weight and speed, that you could eliminate the tendency of the torpedo to roll when it was first fired out of the tube, while the turbine was being accelerated. (R. 86.)

Having demonstrated the correctness of his theory, Lieutenant Davison set about to design an engine in which two turbines of equal size and weight should rotate at the same speed in opposite directions. (Davison, R. 86, 87.) Drawings made by Davison covering an engine of this type were transmitted to the Bureau of Ordnance as early as January 12, 1906, and other drawings were transmitted from time to time during the year. (Williams, R. 37-38, 42-43; Gleaves, R. 53; Davison, R. 87-88.) Davison continued his efforts throughout a considerable part of

1906, during which time he experimented with three different constructions. (Gleaves, R. 53; Davison, R. 90, 92-93.) On October 19, 1906, Davison applied for a patent on his balanced turbine engine, which was granted, and on December 27, 1906, assigned his rights under the patent to the Secretary of the Navy. (Assignment, R. 414; Patent, R. 431.)

(b) *Compound regulator of air*.—During the tests of the first of the Mark VII torpedoes furnished under the contract of June 12, 1912, it was found that they did not meet the specifications governing uniformity of speed throughout the run, due to a too rapid reduction of the pressure in the air flask. (Sawyer, R. 113; Gov't Ex. 64, R. 371; Specifications, R. 406.) To remedy the difficulty the Bureau of Ordnance conceived the idea of using two air regulators or reducing valves in tandem form between the air flask and the nozzle, instead of a single valve as theretofore used. (Sawyer, R. 113, 115; Page, R. 240-242; Gov't Ex. 65, R. 373.)

The design of the device was communicated by Commander F. L. Sawyer, then inspector of ordnance at defendant's plant, orally to Page, defendant's vice president, to Leavitt, defendant's chief engineer, and to Flynn, defendant's shop superintendent, and in addition the device was described generally in a communication to defendant dated January 4, 1913. (Sawyer, R. 113, 115; Page, R. 242-243; Gov't Ex. 64, R. 372; Gov't Ex. 65, R. 373.) By letter dated January 18, 1913, the Bureau of Ordnance notified defendant that the device was deemed

to be embraced in the Protective Clause of the contract. (Gov't Ex. 65, R. 373.) Defendant does not claim that at the time the design was furnished it either owned or was rightfully using the compound air regulator. Indeed, it was not until after considerable negotiation that the Bureau prevailed upon defendant to adopt the device. (Sawyer, R. 113; Page, R. 240; Gov't Ex. 64, R. 271-272.)

(c) *Ball bearings for the gyroscope.*—The naval design of ball bearings for the gyroscope consists of three bearings fitted in a raceway and separated from one another by means of a spacer or retainer designed to hold them in correct position. (Browne, R. 128-129; Leavitt, R. 197-198; Gov't Exs. 52 and 53, R. 430, *et seq.*) The design of the device was submitted to the defendant by letter dated March 31, 1906, which letter also contained the written notice required by the Protective Clause. (Gov't Ex. 51, R. 323.) Defendant admits the furnishing of the design, the receipt of the notice, and that at the time it neither had any property in nor was rightfully using the device. (Def't Br., 77-79.) The only defense interposed under this head is that the naval design of bearing is not contained in the existing type of torpedo and that in so far as that device is concerned the case is moot.

(d) *Improved inside superheater.*—Air for the propulsion of torpedoes is stored cold in the air flask, and upon being used in firing a torpedo is heated to a high degree, the resulting expansion greatly increasing the

power and range of the projectile. (Williams, R. 76, 84.) Two devices for heating the air have heretofore been employed, known as the "inside superheater" and the "outside superheater." (Williams, R. 84-85.) The first named device consists of a heater pot burning alcohol introduced directly into the air flask. (Williams, R. 84; Gov't Exs. 55 and 57, R. 430 et seq.) The outside superheater is a device for heating the air between the air flask and the nozzle. (Williams, R. 84.) Defendant concedes the furnishing of the designs for improvements of the inside superheater together with the required notice, but as in the case of the ball bearings for the gyroscope contends that the device is obsolete and is not contained in the existing type of torpedo. (Gov't Ex. 54, R. 324; Def't Br., 75-76.)

III.

BOTH LOWER COURTS HAVING FOUND IN SUBSTANCE THAT THE DESIGNS OF THE BALANCED TURBINE, BALL BEARINGS FOR THE GYROSCOPE, AND IMPROVED INSIDE SUPERHEATER WERE FURNISHED TO DEFENDANT BY THE GOVERNMENT TOGETHER WITH THE REQUIRED WRITTEN NOTICE, AND THAT DEFENDANT AT THE TIME NEITHER OWNED NOR WAS RIGHTFULLY USING THESE DEVICES, THEIR FINDINGS WILL NOT BE DISTURBED IN THE ABSENCE OF A CLEAR SHOWING THAT THEY WERE ERRONEOUS.

The District Court specifically found that the designs for the balanced turbine, ball bearings for the gyroscope, and improved inside superheater were communicated to defendant together with the written notice prescribed in the contract, and that none of the devices was at the time rightfully in use by defendant. Of these devices the court found that one, the balanced turbine, was contained in the existing type of torpedo, and entered a decree enjoining the unauthorized use or disclosure of that device. On the question of the ownership of the balanced turbine the court found not merely that defendant was not rightfully using the device at the time the design was delivered, but that the device was the invention of Lieutenant Davison, an officer of the Bureau. (Op. Dist. Ct., R. 270, 271.)

No specific findings were made by the Circuit Court of Appeals, except that the balanced turbine was the invention of Lieutenant Davison. (Op. C. C. A., R. 552.) The court, however, affirmed the

decree of the District Court in so far as the balanced turbine was concerned, and ordered that it be amended to include the other devices for which designs were furnished to defendant in the manner prescribed in the contracts. (R. 553; *supra*, pp. 15-16.) As pointed out by the District Judge in a memorandum filed August 25, 1915, the Circuit Court of Appeals nowhere disturbed his findings. (R. 571-572.) And since the Circuit Court of Appeals directed that the injunction be enlarged to include all of the above named devices and one other, it is a necessary inference that it concurred in the lower court's findings of the essential facts.

In view of the substantial agreement of the two lower courts on these findings, it is submitted that this court, in considering the evidence on which the findings are based,

must be governed by the well settled rule in this court that, when two courts have reached the same conclusion on a question of fact, their finding will not be disturbed unless it is clear that their conclusion was erroneous. (*Baker v. Schofield*, 243 U. S. 114, 118.)

To the same effect are: *Compania de Navigation v. Brauer*, 168 U. S. 104, 123; *Baker v. Cummins*, 169 U. S. 189, 198; *Stuart v. Hayden*, 169 U. S. 1, 14; *Towson v. Moore*, 173 U. S. 17, 24; *Smith v. Burnett*, 173 U. S. 430, 436; *Brainard v. Buck*, 184 U. S. 99; *Hy-yu-tse-mil-kin v. Smith*, 194 U. S. 401, 412; *Texas Pacific Ry. Co. v. Railroad Commission*, 232 U. S. 338, 339; *Washington Securities Co. v. United*

States, 234 U. S. 76, 78; *Gilson v. United States*, 234 U. S. 380, 382.

Although the District Court made no finding in respect of the compound regulator of air, and did not include that device in its decree, the Circuit Court of Appeals (Judges Coxe and Rogers concurring and Ward dissenting) specifically found that a design of that device had been furnished defendant together with the required written notice, and ordered that the device be included in the decree. (Op., R. 582-584; *supra*, p. 16.)

IV.

DEFENSES WITH RESPECT TO THE BALANCED TURBINE.

1st, the defendant denies that the Government ever furnished it with a design for a balanced turbine, contending that what purported to be such was merely a design for a single feature of the balanced turbine, namely, the gearing. (Br., Point VI, pp. 50-51, 55-58.)

2nd, assuming the court to find that a design for a balanced turbine *was* furnished, the defendant denies receiving the required notice that the Government considered the device as coming within the Protective Clause. (Br., Point V, pp. 42-49.)

3rd, assuming the court to find both that a design for a balanced turbine was furnished by the Government and that the required written notice was given, the defendant maintains that at the time this was alleged to have been done it was already using in the construction of torpedoes a balanced turbine of its own design and that it has never used the design furnished by the Government. (Br., Point VII, pp. 58-64.)

Passing from defenses of fact to defenses dependent upon the construction of the contract, the defendant further maintains, *4th*, that at the time the alleged design was furnished the balanced turbine was already known in the art, and, therefore, was not within the operation of the Protective Clause, even though it was unknown to the defendant. (Br. Point III, pp. 32-33; Point VI, pp. 52-55.)

5th, that the purpose of the Protective Clause was to preserve secrecy; therefore, the subsequent publication, by the issuance to the inventor of letters patent, of the design for the balanced turbine alleged to have been furnished by the Government, relieved the defendant in respect of that device from the operation of the Protective Clause. (Br., Point III, pp. 31, 34-36.)

6th, that since the contract of 1912 gave the defendant the right to sell torpedoes without any limitation except that expressed in the Protective Clause of *that* contract, the Protective Clause of the contract of 1905 is no longer in effect; that therefore the balanced turbine is not protected from disclosure, since the Protective Clause of the Contract of 1912 speaks only from its date, which was after the design for the balanced turbine had been furnished. (Br., Point IV, pp. 37-42.)

1st. THE CONTENTION THAT THE GOVERNMENT NEVER FURNISHED DEFENDANT WITH A DESIGN FOR A BALANCED TURBINE AND THAT WHAT PURPORTED TO BE SUCH WAS MERELY A DESIGN FOR A SINGLE FEATURE OF THE BALANCED TURBINE, NAMELY, THE GEARING.

(a) *The design covered the complete construction of the balanced turbine and not merely the gearing.*

The design of the balanced turbine, which was duly furnished defendant together with the written notice prescribed in the contract, was introduced in evidence as Government Exhibit No. 28, and is known as Blueprint No. 117-E. (R. 430.) For the convenience of the court Blueprint No. 117-E is reproduced as Appendix A hereto, *infra*, p. 71. It will be noted

that the design covers the complete construction of the balanced turbine and not merely the gearing. This will appear more clearly by comparing this blueprint with Government Exhibit No. 33, the first design of Davison's device, which shows the turbine without the gearing. (R. 430.) Moreover, Blueprint No. 117-E purports to be a design of the complete device and not of any one feature thereof, the inscription reading "Davison's balanced turbine, general arrangement."

(b) *The designation of the design of the balanced turbine as a "design of gears" was made in view of a situation existing in the Navy Department and was not an accurate description of the design.*

After Lieutenant Davison had invented the balanced turbine in the manner above described, he continued his experiments to determine which of several constructions was best adapted for installation in torpedoes. (*Supra*, pp. 22-23.) One of the features of the device to which he gave particular attention was the gearing, of which any number of arrangements were available. The general nature of the device had been made known to the Bureau of Ordnance by the several designs which had been forwarded from time to time. Therefore Commander Gleaves, in forwarding the design known as Blueprint No. 117-E, referred to it simply as a design of gears, since it differed from designs previously furnished the Bureau only in that feature of construction. (Gov't Ex. 29, R. 334; Gov't Exs. 33 and 39, R. 430, *et seq.*; Gov't Exs. 44, 46, 47, and 48, R. 598 *et seq.*)

Lieutenant Commander McCormick and Moses J. O'Brien, his clerk, both testified that, in accordance with the invariable practice obtaining in their office, the letter bearing the two indorsements and the copy of Blueprint No. 117-E were delivered by the latter to the office of the Secretary of the Bliss Company. (R. 25-35, 57-64.) Because of the long lapse of time (more than six years and a half) neither witness could recall the delivery of the letter as a separate independent act (R. 32, 60); but there is a presumption growing out of the long-continued course of business that the letter was actually delivered. (*Jones, Comm. on Evidence*, sec. 52; *Greenleaf on Evidence*, 16th Ed., sec. 40; *Rosenthal v. Walker*, 111 U. S. 185, 193; *Knickerbocker Life Ins. Co. v. Pendleton*, 115 U. S. 339, 345; *Henderson v. Carbondale Coal Co.*, 140 U. S. 25, 36.

* * * The authorities are abundant to the proposition that, where a question is made whether a certain paper, or other document, has reached the hand of the person for whom it was intended, proof of a usage to deliver such papers at the house, or of the duty of a certain messenger to deliver such papers, creates a presumption that the paper in question was actually so delivered. Business could hardly be carried on without indulging in the presumption that employes, who have certain duties to perform, and are known generally to perform such duties, will actually perform them in connection with a particular case (*Dunlop v. United States*, 165 U. S. 483, 495.)

The receipt of this letter was never acknowledged by the company, and it was not returned until January 21, 1907, when Mr. O'Brien went to the secretary's office and requested it.¹ (R. 33-34, 59.) On the last mentioned date the letter was returned by Lieutenant Commander McCormick to the Bureau of Ordnance, together with a third endorsement, the essential part of which is as follows:

Respectfully referred to the Bureau of Ordnance.

1. The E. W. Bliss Company returned letter this day without comment or endorsement.

2. The Stamp of the Company on the face of letter and on one endorsement shows letter to have been in their possession. (R. 30-31, 59-60, 335-336.)

Defendant's time stamp bearing the words "E. W. Bliss Co., Secretary's Desk, Jan. 10, 1907," and a representation of the dial of a clock with the hour hand pointing to about 5 o'clock, appears in blue ink on the face of the letter and also on the face of the second endorsement. (R. 29.) Since the slip on which the second endorsement was typed overlapped and thus protected the first endorsement, no mark in ink appears thereon; but in thus printing

¹ Lieutenant Commander McCormick testified that he made unusual efforts to have the Bliss Company acknowledge and return the letter, and that he had several conversations with Page, the company's vice president, in that connection. (R. 33-34.) McCormick was mistaken as to the identity of the official with whom he had these conversations, as Page testified that he was in Europe at that time. (R. 132-133.) Be that as it may, it was only because of his inability to obtain an acknowledgment from the company that McCormick concluded to return the letter to the Bureau of Ordnance with only the company's stamp to show it had been in the company's possession. (R. 33.)

the stamp on the second endorsement, a corresponding physical impression was made on the first endorsement, and this impression may be clearly observed with the aid of a magnifying glass. (R. 59-60.)

Furthermore, in addition to defendant's time stamp, the name "Leavitt" had been written in pencil on the upper left-hand corner of the letter (R. 64), and the inference is irresistible that this was done by the Secretary of the company whose duty it was to receive and distribute the company's mail. (R. 144-145.) One Seaman was secretary of the company at that time and was still employed in that capacity at the time of the trial (R. 59, 144-145), and although he was readily available as a witness for the defendant to prove that the name "Leavitt" was not in his handwriting, he was not called. Defendant's failure to call him to the stand, under the circumstances, is significant. (*Jones, Comm. on Evidence*, secs. 19-20.)

Finally, although Page and Leavitt both testified that they had never seen this letter (R. 135, 192), Leavitt, in a letter written December 10, 1912, admits having received in January 1907 the copy of Blueprint No. 117-E accompanying the letter. (R. 365-367.)

3rd. THE CONTENTION THAT AT THE TIME THE DESIGN OF DAVISON'S BALANCED TURBINE IS ALLEGED TO HAVE BEEN FURNISHED DEFENDANT WAS ALREADY USING IN THE CONSTRUCTION OF TORPEDOES A BALANCED TURBINE OF ITS OWN DESIGN AND THAT IT HAS NEVER USED THE DESIGN FURNISHED BY THE GOVERNMENT.

In substance defendant contends that at the time the Davison design was communicated to it, it was already using its own design—the so-called Dieter design—of balanced turbine, and that it is now using a type of balanced turbine designed by Mr. Leavitt.

(a) *The so-called Dieter design of balanced turbine was not brought forth by defendant until after it had been apprised of Davison's invention.*

In the early part of October, 1906, tests of the first of the 21-inch Mark I torpedoes constructed under the contract of November 22, 1905, were had at Sag Harbor (Williams, R. 38-39; Page, R. 146-147.) These tests were in the main unsatisfactory, the torpedoes failing to meet the requirements of the contract both as to speed and range. (R. 325-327.) On October 17, 1906, defendant reported the results of these tests to the Bureau of Ordnance, concluding with the following requests:

Under these circumstances and as we have exhausted every means which occurs to us to attain the 3,500 yd. range, we would respectfully request that the requirements be changed to 28 knots at 3,000 yards in place of 26 knots at 3,500 yds. (R. 326.)

By letter dated October 22, 1906, the Bureau informed defendant that its request would receive

consideration, but that before any conclusion was reached it would be desirable to hold further tests in the presence of the Torpedo Board. (R. 328-329.) Included in the letter was the following significant reference to the balanced turbine which Lieutenant Davison had invented at the Naval Torpedo Station:

The Bureau believes that this torpedo can be made to run 3,500 yards, or at least much nearer to that distance than at present, by the installation of an improved propelling mechanism which has recently been tested at torpedo station. The results of these tests the in the Mark III indicated that both the range and speed were materially increased and while these improvements may have been due to the elimination of sheer, which the new propelling mechanism accomplishes, . . . the Bureau believes that the increase in range and speed are due to some extent to the superior efficiency of the engine itself. (R. 328.)

Accordingly, on October 30, 1906, the Torpedo Board assembled at Sag Harbor to witness the further tests of the torpedoes and to discuss the failure of the torpedoes to meet the contract requirements. (Page, R. 148.) At this meeting, at which Page, vice-president of the company was present (R. 148), various plans and devices for improving the performance of the torpedoes, including the balanced turbine, were freely discussed. (Page, R. 146-147; Deft. Ex. 145, R. 333.) According to Commander Gleaves, Lieutenant Davison's invention "was brought up in a way to give the Bliss Company the idea involved but without details." (R. 333.)

On November 9, 1906, the Bureau advised defendant that, in view of the Bureau's belief that a range of 3,500 yards at 26 knots could be attained by a more efficient utilization of the power contained in the air flask, it would for the time being adhere to the requirements of the contract, and requested that ten 21-inch torpedoes be sent to the Naval Torpedo Station for modification of the turbines (R. 329-330.) Paragraph 4 of the letter frankly disclosed the nature of the Government's "improved propelling mechanism":

The Bureau will furnish the E. W. Bliss Company at a later date with the plans of balanced turbines turning in opposite directions, which is the principle of the new mechanism, and the Bureau desires that the balanced turbine principle in torpedoes be considered as falling under the provisions of clause 19 of the contract for these torpedoes. (R. 330.)

In the face of all this evidence proving conclusively that defendant had been apprised of the nature of Lieutenant Davison's invention,¹ it is nevertheless contended that sometime during the early part of November 1906 Page personally conceived the idea of a balanced turbine engine. (Page, R. 146.) This contention is all the more remarkable in view of the fact that Page was not an engineer and possessed no technical or scientific training as such (R. 227, 242), and that he claims to have accomplished this feat

¹ It should also be borne in mind that prior to this time—to wit, on October 19, 1906—Davison had made application for a patent covering his invention. (R. 431.)

without the assistance or even the knowledge of Leavitt, defendant's chief engineer. (R. 225.) Page communicated his idea to William Dieter, one of defendant's draftsmen, who "marked up" a blueprint of an unbalanced turbine to serve as a working plan for the new design. (Page, R. 149, 151; Dieter, R. 152-153.)

Steps were immediately taken to construct an experimental turbine in conformity with this plan, and the device was "rushed through" defendant's works, with the result that within one month after the first rough drawing was made defendant had actually produced an experimental balanced turbine.¹ (Page, R. 141; Dieter, R. 156-157, 159-160; Leavitt, R. 209.) The device was built by simply introducing in an unbalanced turbine an additional wheel together with a reversing gear. (Page, R. 140.) Because of faulty gearing the turbines did not revolve at equal speeds, and the device, therefore, was not completely balanced (Leavitt, R. 191); and upon being subjected to tests it appeared that the gyroscopic action had not been entirely eliminated. (Leavitt, R. 186; Deft. Ex. 141, R. 336.) In principle, however, the device was the same as the balanced turbine invented by Lieutenant Davison. (Williams, R. 41.)

In view of the evidence showing conclusively that defendant had come to a knowledge of the nature of Davison's invention prior to the time that Page

¹ The date of its completion is fixed by the visit of a Mr. Yamashita of the Japanese Navy who was conducted through defendant's works on or about December 11, 1906. (Page, R. 139-141; Deft. Ex. 117, R. 332.)

"conceived" his idea of a balanced turbine, and in view of the admission that the experimental turbine based on Page's alleged conception was rushed through defendant's works, it is impossible to escape the conviction that this design had its inception in the intimations and suggestions concerning Davison's invention which had reached defendant, and that it was brought forth to deprive the Government of the protection to which it was entitled under the Protective Clause.

(b) *Davison's design for a balanced turbine in all its essential features is embodied in the existing type of Bliss-Leavitt torpedo.*

The so-called Leavitt design of balanced turbine, which defendant claims is used in the existing type of Bliss-Leavitt torpedo, is covered by a patent to Leavitt dated February 24, 1914 (almost a year after the institution of this suit), and contains all the essential features of the Davison design.¹

The essential features of a balanced turbine are (a) double turbines rotating in opposite directions, (b) *some* form of gearing whereby the two turbines may be limited to the same speed, and (c) proper proportioning of weights and dimensions so as to secure a perfect balance. (Williams, R. 36; Decker, R. 66; Davison patent, R. 431; Leavitt application, R. 419;

¹ The two designs are fully described in the respective patents. The claims of the Leavitt patent differ from those of the Davison patent in only two unimportant features. In the first place the Leavitt patent claims two turbines rotating on a transverse axis (i. e., horizontal plane), whereas the Davison patent specifies turbines rotating on a vertical plane. In the second place the Leavitt patent claims a somewhat different arrangement of the gears. (Davison patent, R. 431; Leavitt patent, R. 545.)

infra, pp. 72-73.) These essential features are thus set out in the description of a balanced turbine contained in the Davison patent:

The method of compensating torpedoes driven by turbines or other forms of rotary engines or rotary devices, against errors in direction occasioned by gyroscopic action of the rotating parts, which consists in mounting the rotating parts symmetrically in pairs about a common axis, in driving the two members of each pair of parts in reverse directions at equal speeds and in proportioning the weights and dimensions of these parts so that the sum of the moments of inertia in one direction may neutralize the sum of the moments of inertia in the reverse direction, causing a resultant dynamic stability, substantially as described. (R. 436-437.)

Leavitt expressly recognized these essential features in his original application for a patent:

In driving the torpedo by means of a turbine it is desirable, for reasons fully explained in United States patent to Davison, No. 858,266, granted June 25, 1907, to provide two turbine wheels revolving in opposite directions at equal speeds [their weights and dimensions being so proportioned that the sum of the moments of inertia in the one direction may neutralize the sum of the moments of inertia in the reverse direction, thereby eliminating the gyroscopic action which would be liable to interfere with the proper steering of the torpedo.]¹ (R. 419.)

¹ The application was subsequently amended by striking out the portion set out in brackets. (R. 419, 427.)

The testimony is uncontradicted that the Leavitt design of balanced turbine, used in the existing type of Bliss-Leavitt torpedo, embodies all the essential features of the Davison design. (Williams, R. 50; Decker, R. 65, 67-68; Davison, R. 89.) It differs from the Davison design in only two unessential points of construction. In the first place, the turbines are so constructed as to operate on a horizontal plane, whereas in the Davison design the turbines rotate on a vertical plane. (Williams, R. 45; Decker, R. 72; Browne, R. 127; Leavitt, R. 193; Davison patent, R. 431; Leavitt patent, R. 545.) In the second place, the turbines are geared together and to the shaft by means of eight gears, whereas in the Davison design sixteen gears are employed for that purpose. (Williams, R. 49-50; Browne, R. 127; Davison patent, R. 341; Leavitt patent, R. 545.)

With respect to the change of the turbine wheels from the vertical plane, as in the Davison design, to the horizontal plane, as in the present design, Leavitt expressly admits that, so far as the turbines themselves are concerned, there is in effect "no appreciable difference" between the two designs.¹

¹ While Leavitt claims no essential difference by reason of the change in the turbines, he does claim an essential difference by reason of a change in the position of the air nozzle. In substance, he contends that, because in the existing type of torpedo the turbines operate on a horizontal instead of a vertical plane, it makes no difference whether the wheels are balanced or not, for the alleged reason that when the turbines occupy a horizontal plane the nozzle from which the compressed air flows toward the wheels is so placed that the nozzle reaction becomes negligible. (R., 194-196.) Leavitt's explanation seems to be that, while in the case of a turbine operating on a vertical plane the nozzle reaction tends to roll the torpedo on its longitudinal axis, in the case of a turbine revolving on a horizontal plane the nozzle reaction has a tendency to swerve the torpedo bodily on

(R. 193.) And with respect to the change in gearing, it will be recalled that at the time the Davison design was communicated to defendant, the Government was not committed to any particular form of gearing, the letter accompanying the design expressly stating that—

Numerous other designs equally good can doubtless be made, *for the problem resolves itself simply into an arrangement of gears.*
(Gov't. Ex. 29, R. 334.) [Italics ours.]

Commander Williams, a naval officer since 1886, and for many years connected with the Bureau of Ordnance (R. 34), testified in respect of the Leavitt and Davison designs, as follows:

its vertical axis, but in the latter case the length and weight of the torpedo are so great as compared with the reactive force that that tendency is negligible.

The Government's witnesses, Williamson and Decker, both testified that, as a matter of fact, while in the case of a turbine revolving on a horizontal plane, the *first* tendency of the nozzle reaction would be to swerve the torpedo on its vertical axis (i. e., to tip it from end to end), the *resultant* effect would be to cause the torpedo to roll on its longitudinal axis (i. e., to roll from side to side); for the reason that, while the torpedo, because of its length and weight, is not free to swerve bodily on its vertical axis, it is quite free to roll on its longitudinal axis, and the inevitable effect of the reaction would be to cause it thus to roll. (R. 50-51, 71-73.)

However that may be, Leavitt's contention amounts to no more than this: That the erratic performance of the torpedoes manufactured prior to 1907 was not due to the unbalanced turbine, but to the position of the air nozzle, and that with the nozzle located as in the existing type of torpedo, it makes no difference whether the turbines are balanced or not. (R. 183-185.) It is submitted, however, that this proceeding in no way involves the issue whether an unbalanced turbine revolving on a horizontal plane is just as good or even better than the balanced turbine. But notwithstanding Leavitt's stated belief that there is no particular virtue in the balanced form of turbine, his company still contends with great vigor for the right to use that device, and Leavitt himself has declared that "in driving the torpedo by means of a turbine it is desirable . . . to provide two turbine wheels revolving in opposite directions at equal speeds." (R. 419, 545.)

Q. These variances as pointed out by you between the drawings in the upper left hand corner of January 2nd, 1907, and the one in the lower left hand corner of May 13th, 1912, were all of minor details of the turbine engine?

A. They were differences with regard to the gearing between the turbine and the shaft.

Q. That is, they were differences merely in the gearing?

A. In the gearing.

Q. But the balanced turbine principle is still in the present torpedo as it was represented in the drawing of January 2nd, 1907, is that right?

A. Yes. (R. 50.)

Delbert H. Decker, formerly an examiner of the Patent Office, an experienced patent attorney, and a well-known patent expert (R. 64-65), testified to the same effect:

Q. How does the design disclosed by blueprint 117 E marked Exhibit 28 compare with the balanced turbine as shown in the physical embodiment of the torpedo which is marked for identification in this case?

A. The balanced turbine in both instances is the same.

* * * * *

Q. In your opinion, based upon your knowledge, qualifications and experience, does the disclosure of the balanced turbine conveyed in the blueprint 117 E dominate the structure of the balanced turbine embodied in the torpedo marked here for identification?

A. It is my opinion that it does. (R. 65.)

And Lieutenant Davison, the inventor of the balanced turbine (*supra*, pp. 21-23), for many years an officer of the Navy, and now a practicing engineer (R. 85), testified as follows:

Q. In your opinion is the principle of the device disclosed in blueprint 117 E as to the balanced turbine the same as the principle of the balanced turbine embodied in the torpedo exhibit?

A. Yes.

* * * * *

Q. Does the change in the location of the balanced turbine in the body of the torpedo from the vertical to the horizontal plane affect or change the principle of the action of the balanced turbine itself?

A. No. (R. 89.)

Since, therefore, the device contained in the existing type of torpedo embodies all the essential features of the Davison design it is wholly immaterial that mechanical alterations or improvements may have been made in the device.¹ *Walker on Patents*, 5th Ed., sec. 347-348; *Sewall v. Jones*, 91 U. S. 171, 183; *Comptograph Co. v. Mechanical Accountant Co.*, 145 Fed. 331, 338; *Western Telephone Mfg. Co. v. American Electric Telephone Co.*, 131 Fed. 75, 78; *Lourie Improvement Co. v. Lenhart*, 130 Fed. 122, 129; *Cimiotti Unhairing Co. v. American Unhairing*

¹ The law on this point is thus aptly summarized in the opinion of Judge Veeder of the District Court:—"In reaching this conclusion [that the Davison design is embodied in the existing type of torpedo] my criterion has been: do the essential features and functions of the device appear? If they do, then mechanical alterations, although they add to its efficiency, or even improvements which disclose invention, are immaterial." (R. 271.)

Mach. Co., 115 Fed. 498, 504-505; *Crown Cork & Seal Co. v. Aluminum Stopper Co.*, 108 Fed. 845, 866; *Massath v. Palm*, 51 Fed. 824, 826; *Norton v. Jensen*, 49 Fed. 859, 868; *Norton v. California Automatic Can Co.*, 45 Fed. 637, 638; *Wheeler v. Clipper Mower Co.*, 29 Fed. Cas. 881, 892; *Sarven v. Hall*, 21 Fed. Cas. 512, 519; *Kendrick v. Emmons*, 14 Fed. Cas. 305, 306.

4th. THE CONTENTION THAT AT THE TIME THE ALLEGED DESIGN WAS FURNISHED THE BALANCED TURBINE WAS ALREADY KNOWN IN THE ART, AND, THEREFORE, NOT WITHIN THE OPERATION OF THE PROTECTIVE CLAUSE, EVEN THOUGH IT WAS UNKNOWN TO THE DEFENDANT.

Defendant contends, to use its own language, that at the time the Davison design was communicated to it, the *principle* of the balanced turbine was already well known in the art.

There are four answers to this contention.

First. Although defendant was first notified that the balanced turbine was deemed to come within the provisions of the Protective Clause on November 9, 1906 (R. 330), and this notification was renewed on December 17, 1906 (R. 332-333), and again on January 10, 1907 (R. 335), it was not until April 5, 1911, when it was negotiating with the Japanese Government for the sale of torpedoes, that defendant contested this claim on the ground of lack of originality or otherwise. (R. 362, 363.) As pointed out by the District Judge—

it would be obviously inequitable to permit it (defendant) to use, for a period of years, in

making torpedoes for the Government, a device furnished by the Government, and then when it seeks to sell the developed torpedo to other persons or governments, to raise for the first time an issue of prior knowledge or prior art. (R. 270.)

Second. The contention imports into the Protective Clause a limitation which is not there, namely, that only devices which are patentable or novel are within the protection of the clause. Even, therefore, were the contention true in fact, it would have no standing under the contract.

On this point the District Judge said:

The defendant contends that the word "furnished" must be construed to mean the furnishing of devices which were unknown not only to the defendant but in the prior art as well; in other words, such devices only as were patentable at the time the design was furnished. I am unable to assent to such a construction. *It is warranted neither by the plain wording of the contract nor by the surrounding circumstances.* The evidence shows that the Navy Department was carrying on extensive independent experiments with torpedoes, utilizing the skill and experience of its own officers. The defendant was occupied in developing its torpedo in conformity with the wishes of its sole customer. Inasmuch, however, as the defendant was not prohibited from making torpedoes for others, some provision was necessary to protect the Government in its contributions to the joint result. . . . *It seems plain to me that in the consideration of any con-*

tribution made by the Government, the prior art, as well as defendant's actual knowledge with respect thereto, is as irrelevant as the question whether any such device was more or less efficient than another device which was available and might have been used. "Furnish," as used in the context, means simply supplying a device not then in use in the torpedo. It is urged that this conclusion will bear heavily upon the defendant, since it may conceivably result in depriving it of the commercial use of devices available to others as a part of the prior art. But if the consequences of its formal agreement were at all relevant to the issue, it would be reasonable to suppose that they were carefully considered in the formation of its very valuable business relations with the Government. (R. 270.) [Italics ours.]

Third. As a matter of fact, however, the principle of the balanced turbine as applied to the propulsion of torpedoes was not already known in the art. To assert that it was is tantamount to asserting that Lieut. Davison did not invent the device. This, as we have seen, is contrary to the finding of both lower courts. (*Supra*, p. 26.) In view of the agreement of both lower courts on this question of fact, we have relegated to the appendix the discussion of the evidence in relation to it. (*Infra*, p. 72.)

Fourth. The contention misconceives the nature of the proceeding, which is not an action to enjoin the infringement of the Davison patent, but a suit to enjoin defendant from violating its contract obligation.

It may be conceded that if this were a suit to enjoin the infringement of the patent issued to Davison and by him assigned to the Secretary of the Navy, it would be entirely competent for defendant to attack the validity of the patent and in doing so to prove (if possible) that the subject of the patent lacked originality. Inasmuch, however, as the proceeding is based entirely upon the contract, and in no wise involves the Davison patent, defendant's contention is wholly irrelevant.

The case is precisely analogous to a suit to enjoin the unauthorized use or disclosure of a trade secret. In such cases the courts are agreed that the inventor or assignee of a secret device or process may maintain a suit in equity against one who, in violation of a contract express or implied, or in breach of a confidential relationship, undertakes to divulge the secret or to appropriate it to its own use, regardless of whether or not the secret device or process is a proper subject for a patent.

In the leading case of *Vulcan Detinning Co. v. American Can Co.*, 72 N. J. Eq. 387, 12 L. R. A. (n. s.) 102, it appeared not only that others were acquainted with the alleged secret process, but that the complainant's assignor had actually stolen the process. It was urged in behalf of the defendant that no suit could be maintained in respect of the process, since complainant's title thereto was not clear. But the New Jersey Court of Errors and Appeals held that the history of the process was not an issue in the suit and that the only question in-

volved was the alleged violation of the contract between the complainant and the defendant. The court said:

Counsel for the defendant, with much confidence, argues that the complainant is entitled to no relief because the secret process it seeks to enjoin the defendants from using is not in fact a secret, and secondly, because if it is a secret the legal title to such secret is not in the complainant. (72 N. J. Eq. 394.)

* * * * *

It should be noted, however, that there is a wide difference between the absolute secrecy which the discoverer of a process has the legal right to protect, and the qualified secrecy which the complainant claims the equitable right to secure. (*Id.* 393.)

* * * * *

In the application of these general principles the secrecy with which a court of equity deals is not necessarily that absolute secrecy that inheres in discovery, but that qualified secrecy that arises from mutual understanding and that is required alike by good faith and by good morals. (*Id.* 396.)

* * * * *

The conclusion to which the foregoing considerations lead is that entirely aside from the technical secrecy of the process or the abstract question of property therein, the complainant is entitled to have its trustee, his associates and their servants restrained from using against the interests of the complainant the very process with which its trustee was entrusted for its benefit. (*Id.* 397.)

In *Westervelt et al. v. The National Paper Supply Co.*, 154 Indiana, 673, it was held that where a company engaged in the manufacture of paper bags employed a person to work in its factory who had partially completed a paper bag machine, with the understanding that the employee should complete the machine at the company's expense, and that the machine when completed should belong to the company as a trade secret, an action may be maintained by the company to enjoin the employee from divulging the secret to others, notwithstanding the fact that the machine was so lacking in novelty as not to be the proper subject of a patent.

The court said:

It is settled by the great weight of the authority that when one invents or discovers, or procures another to invent and discover for him and keep secret a process of manufacture, *whether a proper subject for a patent or not*, while he has not an exclusive right against the public, or against those who in good faith acquire a knowledge of it, yet he has such a property in it as a court of chancery will protect against one who, in violation of a contract, express or implied, or a breach of confidence, undertakes to apply it to his own use. (pp. 677-678.) [Italics ours.]

In a similar case, *Peabody et al. v. Norfolk et al.*, 98 Mass. 453, the Supreme Judicial Court of Massachusetts, speaking through Mr. Justice Gray, said:

If he [an individual] invents and discovers, and keeps secret, a process of manufacture,

whether a proper subject for a patent or not, he has not indeed an exclusive right to it as against the public, or against those who in good faith acquire knowledge of it; but he has a property in it, which a court of chancery will protect against one who in violation of contract and breach of confidence undertakes to apply to his own use, or to disclose it to third persons. The jurisdiction in equity to interfere by injunction to prevent such a breach of trust, when the injury would be irreparable and the remedy at law inadequate, is well established by authority. (p. 458.) [Italics ours.]

To the same effect are *National Gum, etc. Co. v. Braendly*, 27 App. Div. (N. Y.) 219; *Eastman Kodak Co. v. Reichenbach*, 79 Hun (N. Y.) 183; *Tabor v. Hoffman*, 118 N. Y. 30; *Thum Co. v. Tloczynski*, 114 Mich. 149; *Saloman v. Hertz*, 40 N. J. Eq. 400; *Morrison v. Moat*, 21 Law J., Ch. (N. S.) 248; *Hopkins on Trademarks, etc.*, 3rd Ed., p. 256; *High on Injunctions*, 4th Ed., sec. 984.

5TH. THE CONTENTION THAT THE PURPOSE OF THE PROTECTIVE CLAUSE WAS TO PRESERVE SECRECY; THAT THEREFORE THE SUBSEQUENT PUBLICATION, BY THE ISSUANCE TO THE INVENTOR OF LETTERS PATENT, OF THE DESIGN FOR THE BALANCED TURBINE ALLEGED TO HAVE BEEN FURNISHED BY THE GOVERNMENT, RELIEVED THE DEFENDANT IN RESPECT OF THAT DEVICE FROM THE OPERATION OF THE PROTECTIVE CLAUSE.

In addition to the United States patent granted to Davison and by him assigned to the Secretary of the Navy, a number of foreign patents have been issued

covering Davison's device.¹ (Davison, R. 94-95; Stipulation, R. 287.) Because of the issuance of these several patents defendant contends that the secrecy of the device—or, rather, of the principle—has been destroyed. The contention is thus summarized in defendant's letter to the Secretary of the Navy dated May 9, 1913:

We have repeatedly insisted that said article of the contract [the secrecy clause] did not apply for the protection of any principle,² but merely "to any device the design for which" was furnished to us by the Government; that the specific design furnished has been and will be kept secret; that the "principle" having been made public by the grant by the Government of a patent for it . . . the "principle" of the balanced turbine is no longer a confidential matter, and we can not be held to secrecy which the Government itself waived. (R. 378.)

In the first place, the contention has no bearing upon the case, for while the Government undoubtedly

¹ The foreign patents were subsequently assigned by Lieutenant Davison to the defendant, apparently with the knowledge and sanction of his superior officers. (Davison, R. 94-95.) Defendant, of course, does not contend that by reason of the ownership of these patents it possesses any right to manufacture or exhibit balanced turbines in the United States, and since the threatened disclosure of the device evidently is to take place in this country, the rights (if any) which defendant may have by reason of such ownership are not involved in the case. (Op. C. C. A., R. 552.)

² So far as the attempted distinction between the Davison design and the "principle" of the balanced turbine is concerned, that is but another way of saying—contrary to the finding of both lower courts and the indisputable evidence (*supra*, p. 26)—that the Davison design is not embodied in the existing type of torpedo. For, as stated by the Circuit Court of Appeals, "a principle is not the subject of a patent except through the instrumentalities by which it is carried out" (R. 552), and in this case the instrumentality is the Davison design of balanced turbine.

may make such use or disclosures of its secret devices and processes as it sees fit, it by no means follows that the Government thereby authorizes defendant, its "confidential agent" (Op. C. C. A., R. 552), to make such disclosures or to appropriate the devices to its own use. On this point the Circuit Court of Appeals said:

We fail to see how the defendant has acquired a right to do what it promised it would not do because a patent has been issued which makes public some of the devices used in the manufacture of the Bliss-Leavitt torpedo. (R. 552; see also Op. Dist. Ct., R. 271-272.)

The contention, moreover, entirely overlooks the fundamental principle that, in suits of this character,

the secrecy with which a court of equity deals is not necessarily that absolute secrecy that inheres in discovery, but that qualified secrecy that arises from mutual understanding and that is required alike by good faith and by good morals. (*Vulcan Detinning Co. v. American Can Co.*, 72 N. J. Eq. 387, 396.)

Again, it is a matter of common knowledge of which the court will take judicial notice that the mere issuance of a patent of itself does not have the effect to make generally known the secret of the invention; first because the information contained in a patent specification usually is too general to be used as a working design in reproducing the patent device, and second because patents usually come under the observation of only a limited number of persons. As said

by Judge Shiras of the Circuit Court for the northern district of Iowa in disposing of a similar contention:

Many an invention and many an idea of value are doubtless to be found in the records of the Patent Office, but, so far as public actual knowledge thereof is concerned, they might as well be nonexistent. (*Benton v. Ward*, 59 Fed. 411, 413.)

Finally, by defendants' own admission, the granting of these patents has not, as a matter of fact, had the effect to destroy the secrecy of Davison's invention. In a letter to the Bureau of Ordnance dated December 19, 1912, urging that the Government purchase the so-called "exclusive rights" to the Bliss-Leavitt torpedo, defendant said:

We believe in view of the history during the last number of years in connection with the development of this torpedo that it has been clearly demonstrated that the publication of those patents or later patents in no way prevented the matter from being kept secret. This is instanced by the fact which the Bureau has very clearly stated to us that although the foreign manufacturers and governments have used every endeavor to produce a torpedo similar to ours abroad, they have been unable to do so . . . (R. 369-370.)

And in its letter of May 9, 1913, defendant refers to "the admittedly peculiar excellence" of the Bliss-Leavitt torpedo. (R. 379; see also Op. C. C. A., R. 552.)

8th. THE CONTENTION THAT SINCE THE CONTRACT OF 1912 GAVE DEFENDANT THE RIGHT TO SELL TORPEDOES WITHOUT ANY LIMITATION EXCEPT THAT EXPRESSED IN THE PROTECTIVE CLAUSE OF THAT CONTRACT, THE PROTECTIVE CLAUSE OF THE CONTRACT OF 1905 IS NO LONGER IN EFFECT; THAT THEREFORE THE BALANCED TURBINE IS NOT PROTECTED FROM DISCLOSURE, SINCE THE PROTECTIVE CLAUSE OF THE 1912 CONTRACT SPEAKS ONLY FROM ITS DATE, WHICH WAS AFTER THE DESIGN OF THE BALANCED TURBINE HAD BEEN FURNISHED.

Three of the devices involved in this litigation—balanced turbine, ball bearings for gyroscope, and inside superheater—were communicated to the defendant under the Protective Clause of the contract of November 22, 1905, and the remaining device—the compound air regulator—was conveyed under the corresponding clause of the contract of June 12, 1912. The defendant now insists that by the provisions of section 2 of the contract of June 12, 1912, it was expressly authorized to manufacture for whomsoever it pleased torpedoes containing devices communicated to it under the Protective Clause of the earlier agreement.

Section 2 of the 1912 contract, upon which the contention is based, provides for the manufacture of 120 Mark VII torpedoes in conformity with certain drawings, plans and specifications approved by the Bureau of Ordnance, recites that the drawings, plans and specifications contain information of a confidential character which can not be made public without detriment to both parties to the agreement, and concludes as follows:

. . . it being understood, however, that nothing in this clause shall be construed as

depriving the party of the first part [the defendant] of the right to make and sell such torpedoes to any other party or government whatsoever, except as limited by clause twentieth [the Protective Clause] of this contract. (R. 388-389; *supra*, pp. 13-41.) [Italics ours.]

In substance defendant's contention amounts to this: That by this language it was expressly authorized to manufacture for any other party or government torpedoes containing any devices whatever, except such devices as might subsequently be communicated to it under the Protective Clause of the 1912 contract.

It is submitted, however, that the obvious purpose of this language was not to confer upon defendant authority to manufacture for nations and individuals torpedoes containing devices communicated to it by the Government of the United States under the Protective Clause of the 1905 contract—a right which it did not then have—but simply to confirm a right which it doubtless already possessed—namely, to manufacture torpedoes for any party or government except as limited by the Protective Clauses of the several contracts. (See Op. D. C., R. 270-271; Op. C. C. A., R. 552.)

The wording of the section, it should be noted, is wholly negative in effect, and does not even suggest an affirmative grant. The word "deprive" implies a preexisting right, and is not appropriate to a grant of authority. *State ex rel. Star Publishing Co. v. Associated Press*, 159 Mo. 410, 442-443; *Appeal of*

Staples, 52 Conn. 421, 423; *Crabb's English Synonyms*, 315.

This is all the more apparent when it is considered that the Government has insisted upon the insertion of the Protective Clause in all contracts negotiated with the defendant since 1905 (*infra*, pp. 12-13); that the Government has at all times insisted upon a rigid adherence to the provisions of the clause (R. 330, 332, 335, 364, 373); and that there was in the 1912 contract no consideration moving to the Government for the relinquishment of rights acquired under the prior contract. Certainly the language quoted from section 2 should not be construed as *sub silentio* depriving the Government without consideration of these very important rights, when clearly there was no intention upon the part of the Government to relinquish them.

V.

DEFENSES WITH RESPECT TO THE COMPOUND REGULATOR OF AIR.

1st, defendant contends that the word "design" as used in the Protective Clause means a blueprint or other drawing; that therefore the oral communication of the plan for the compound regulator of air did not constitute the furnishing of a "design" within the meaning of the Protective Clause. (Br. Point II, pp. 28-30; Point VIII, pp. 67-72.)

2nd, defendant contends that the device for the compound regulator of air lacked originality; that the device was a perfectly obvious one and within the knowledge of defendant's engineers, and that the problem of installing the device—the only problem involved—was worked out by one of defendant's employees. (Br. Point VIII, pp. 68-73.)

1st. THE CONTENTION THAT THE WORD "DESIGN" AS USED IN THE PROTECTIVE CLAUSE MEANS A BLUEPRINT OR OTHER DRAWING; THAT THEREFORE THE ORAL COMMUNICATION OF THE PLAN FOR THE COMPOUND REGULATOR OF AIR DID NOT CONSTITUTE THE FURNISHING OF A "DESIGN" WITHIN THE MEANING OF THE PROTECTIVE CLAUSE.

This contention is founded upon a strict etymological interpretation of a single word of the Protective Clause, and entirely overlooks the effect which such an interpretation would have upon the meaning of the clause as a whole.

In the first place it is obvious that a plan to use two reducing valves in place of one could be just as effectually communicated orally as by means of a drawing. Certainly it can not be contended that the oral communication of the device was not full and complete. Indeed it is quite clear that the representatives to whom Lieutenant Sawyer described the device understood him well enough, for they did not ask that they be furnished with any drawing. (Sawyer, R. 118.) Neither did defendant take advantage of the Bureau's offer to place at its disposal the data obtained during the experiments at the Naval Torpedo Station. (R. 373.) In effect, therefore, defendant contends that it should have been furnished with a blueprint of the device when no necessity existed therefor.

We can not state the answer to the contention better than in the words of the Circuit Court of Appeals:

The question, broadly stated, is whether the contract is to be so literally construed that no improvement, however simple in construction, suggested by the Bureau, can be regarded as belonging to the complainant unless a blueprint or working drawing has been furnished at or prior to giving the notice. It is clear that the contract should not be so strictly construed as to require the officers of the Bureau of Ordnance to do a vain and unnecessary thing. A common sense construction is all that is required. If the defendant

is put in possession of all the facts so that misconception is impossible it should be sufficient. Of course where the proposed change involves a complicated structure or device a blueprint drawing or a model is necessary, but where the mechanical change is so simple that an ordinary artisan will know what to do the moment the change is directed it is not perceived how any additional advice is necessary. If the ordnance officer directs the mechanic to make a valve an inch wider or add an additional valve, indicating the place where it is to be inserted, we do not think a blueprint is necessary to make plainer what is perfectly plain without it.

* * * * *

Briefly the situation was practically this—the Bureau officers said to the Bliss Co.'s officer, "You need another valve, put it here"—indicating the place on the drawing or model where the second valve was to be inserted. This was done and with the result that the defect was remedied. Can it be that the complainant is to lose the benefit of this improvement because its agents did not go through the wholly inconsequential ceremony of furnishing a blueprint? (R. 583.)

To the same effect is the decision in *Westinghouse Electric Co. v. Roberts et al.*, 125 Fed. 6, the substance of which is stated in the syllabus as follows:

Where an inventor communicates his ideas to one who is thoroughly competent to understand and perpetuate them in case of his death, having effectually given his invention to the world in this way, he is entitled to bring

forward the disclosure to maintain the asserted priority of his invention. (See also: *Automatic Weighing Mach. Co. v. Pneumatic Scale Corp.*, 158 Fed. 415; *Pearce v. Mulford*, 102 U. S. 112; *Atlantic Works v. Brady*, 107 U. S. 192; *Aron v. Manhattan Ry. Co.*, 132 U. S. 84; *Walker on Patents*, 5th Ed., sec. 70.)

In the second place, the contention runs directly counter to the purpose and intention of the Protective Clause as expressed in defendant's letter to the Bureau dated October 19, 1905, and accepted by the Bureau. (*Supra*, pp. 9-10.) In order that there might be no misunderstanding of the intention of the parties in regard to the ownership of devices suggested by the Bureau, defendant used the following illustration:

The Bureau found fault with our starting mechanism and wanted something simpler and requiring less attention. *If the Bureau had suggested the use of a breaking tube, this device would clearly have been its sole property.* But as a matter of fact, although it was the Bureau's suggestion that a simpler device be substituted, as we worked out the manner of its accomplishment, we feel it to be our property. (R. 315-316.) [Italics ours.]

As pointed out by Judge Coxe, "We have only to substitute the words 'an additional valve' for the words 'breaking tube,' and we have the opinion of defendant itself that the device for the double regulation of air is the property of the United States." (R. 584.)

2nd. THE CONTENTION THAT THE DEVICE FOR THE COMPOUND REGULATOR OF AIR LACKED ORIGINALITY; THAT THE DEVICE WAS A PERFECTLY OBVIOUS ONE AND WITHIN THE KNOWLEDGE OF DEFENDANT'S ENGINEERS, AND THAT THE PROBLEM OF INSTALLING THE DEVICE—THE ONLY PROBLEM INVOLVED—WAS WORKED OUT BY ONE OF DEFENDANT'S EMPLOYEES.

Defendant contends, in substance, that the principle of the compound air regulator was perfectly obvious and was well known in the art at the time it was communicated by the Inspector of Ordnance; that the only problem in relation to the device requiring the exercise of technical skill was that of installing it in the torpedo in view of the limited space therein and the danger of destroying the balance, and that this problem was solved not by the Government officers but by one of defendant's employees.

It is a sufficient answer to the first part of the contention to say that frequently the most obvious things become the subjects of a patent, but that whether or not the compound air regulator possesses novelty or patentability is a question not germane to the issues of the case for reasons already stated. (*Supra*, pp. 47-53.)

As regards the remainder of the contention, it is evident that the difficulties encountered in installing the device were more imaginary than real. At the time Page was urging these difficulties upon the Navy Department (R. 240), he was also contending that the compound air regulator would not accomplish the result claimed for it. (R. 371-373.) As pointed out by Judge Coxe in the opinion of the Circuit Court

of Appeals upon the rehearing, "the defendant's sole objection seems to have been not that there was any difficulty in making the change, but that it would not accomplish the desired result." (R. 583.) It is obvious, therefore, that Page's principal concern was to secure a reduction of the contract requirements and thereby to avoid the expense incident to the use of an additional reducing valve.

Notwithstanding defendant's protestation that the installation of the device was well-nigh impossible, once it appeared that the Bureau would not abate its insistence thereon, the matter was accomplished seemingly without serious difficulty. Although the Bureau had offered to cooperate with defendant in every way in bringing about this result, its assistance was not requested. (R. 372, 373.) And finally it appears that the supposedly insuperable obstacles to the installation of the device were overcome, not by Leavitt, defendant's chief engineer, or other trained experts of defendant, but by William Dieter,¹ defendant's head draftsman. (Page, R. 243.)

Page's embarrassment when questioned on this point is patent:

Q. But the matter of locating it [the compound regulator] in a torpedo with reference to convenience regarding other parts was a mechanical matter?

A. Why, there are a great many difficult questions coming up in connection with it; the

¹ Dieter is the man who, at the instance of Page, attempted to anticipate Lieutenant Davison's balanced turbine by hurriedly designing a similar device after the defendant had been informed of the nature of Davison's invention. *Supra*, p. 40.)

question of additional weight, placing the weight differently; it was not a simple problem at all.

Q. I know; but the problem of location is one that you would turn over to a mechanic to work out from observation of the available space, isn't it?

A. No; we would turn it over to a skilled engineer; the best brains we could have in our establishment weren't any too good to produce the result.

Q. Who did you turn this matter over to, as to where the double air regulator should be located?

A. Mr. Dieter.

Q. It was too small a problem for yourself or Mr. Leavitt, wasn't it?

A. Well, I would hardly say that. (R. 243.)

VI.

DEFENSES WITH RESPECT TO BALL BEARINGS FOR THE GYROSCOPE AND IMPROVED INSIDE SUPERHEATER.

As to both these devices defendant contends that while they were used in some of the torpedoes manufactured under the early contracts they are now obsolete and are not contained in the existing type of Bliss-Leavitt torpedo; that it has only threatened to disclose the existing type of torpedo, and that therefore the case as to these devices is moot. (Br., Points IX and X, pp. 75-79.)

While the Government design of ball bearings for the gyroscope and improvement in the inside superheater were adopted by defendant and installed in some of the torpedoes manufactured under the contract of November 22, 1905, it is clear upon the record that these devices are not contained in the existing type of Bliss-Leavitt torpedo. (Ans., R. 10; Williams, R. 84-85; Statement of Counsel, R. 98; Page, R. 144; Leavitt, R. 197.)

Defendant, therefore, is correct in its assertion that there has been no express threat on its part to exhibit the operation or divulge the construction of these devices to the representatives of the Whitehead Torpedo Company. (Notice, *supra*, p. 3n.)

Inasmuch, however, as defendant, "the confidential agent of the Government", in threatening to exhibit the devices contained in the existing type of torpedo,

displays a disposition to violate its trust whenever it seems advantageous to do so, and taking into account the character of the case, the peculiar nature of the injury liable to be inflicted, and the incalculable damage which may possibly result, it is submitted that the Government is entitled to an injunction covering all devices communicated to defendant under the Protective Clause of the several agreements.

This course was adopted by the New Jersey Court of Errors and Appeals in *Vulcan Detinning Co. v. American Can Co.*, 72 N. J. Eq. 387, 12 L. R. A. (n. s.), 102. There the confidential agent of the complainant in violation of his contract obligation had installed the secret device for a rival manufacturer, and the principal relief sought was an injunction against such unfair competition. Incidentally the bill prayed for an injunction against the agent to restrain him from publishing or communicating the secret to others. Although there was no express threat on the part of the agent to divulge the secret, the court awarded an injunction, saying:

Incidental to this relief, and resting upon the same equitable jurisdiction, is the restraining of the defendant from publishing the process itself, of which, however, there is no proof of any present threat or intention. Indeed, so long as the present state of affairs exists, such publication would be equally injurious to both parties. . . . I am not suggesting that the complainant is not entitled to an injunction enjoining publication, for I think that it is. (*Id.* p. 396.)

The imminence of the danger of unauthorized publication of these devices and the consequent need for injunctive protection is very clear when we consider that the threatened exhibition of the existing type of torpedo necessarily involves a visit to defendant's plant by the representatives of the Whitehead Company and a general interchange of views and information between those representatives and the officers and employees of defendant concerning the design and construction of torpedoes.

It is improbable that such a visit and conference should take place without the representatives of the Whitehead Company obtaining information concerning all useful devices which have at any time been used by defendant, unless the latter shall be placed under injunction to refrain from disclosing in any manner such devices as are entitled to protection under the several contracts.

This is illustrated by an event which occurred in 1906, during an inspection of defendant's plant by Mr. Yamashita of the Japanese Navy. While passing through the works Mr. Yamashita came upon a balanced turbine engine which was lying on the floor, and while this device was one coming under the protection of the Protective Clause of the agreement of 1905, it was not until this foreign officer had inspected the device and had rotated the upper disc by hand, that his attention was directed elsewhere. (Page, R. 139-142; Leavitt, R. 185-186; Deft. Ex. 117, R. 332.)

CONCLUSION.

The decree of the Circuit Court of Appeals should be affirmed.

• G. CARROLL TODD,

The Assistant to the Attorney General.

A. F. MYERS,

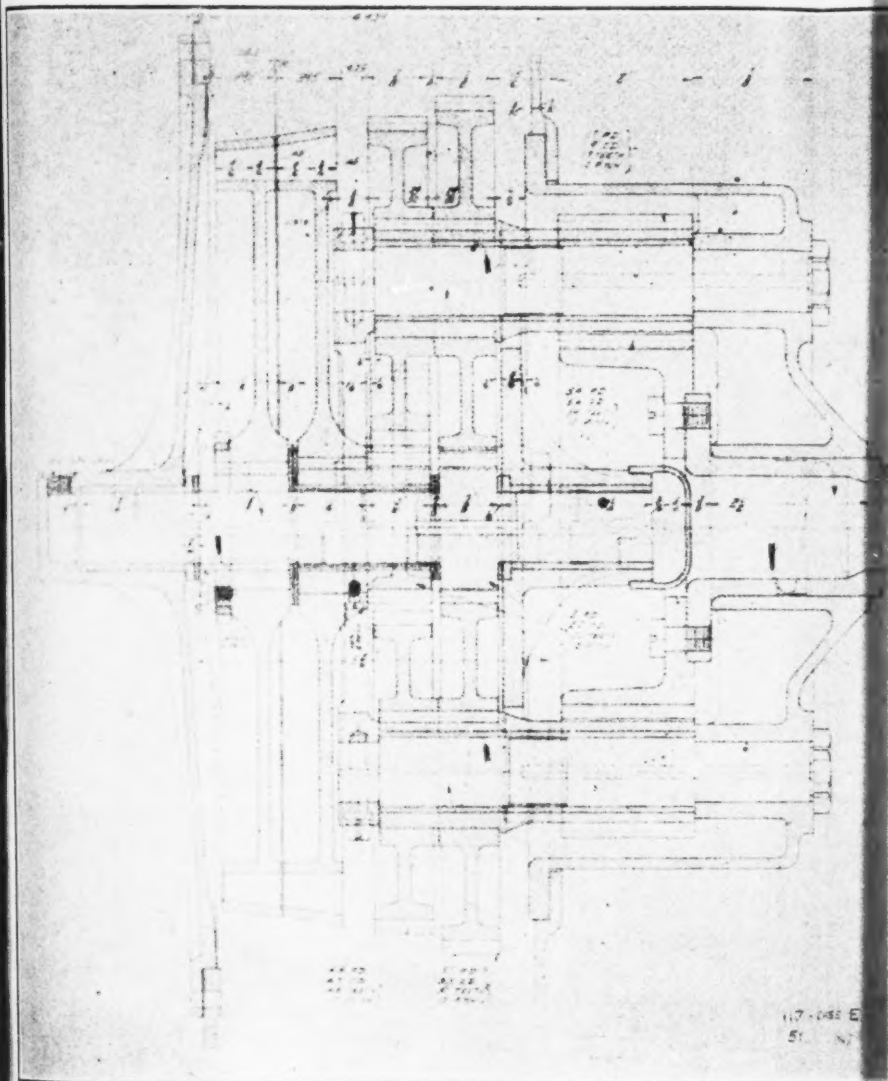
Attorney, Department of Justice.

OCTOBER, 1918.

APPENDIX A.

Blueprint No. 117 E, Government Bldg

(R. 431.)



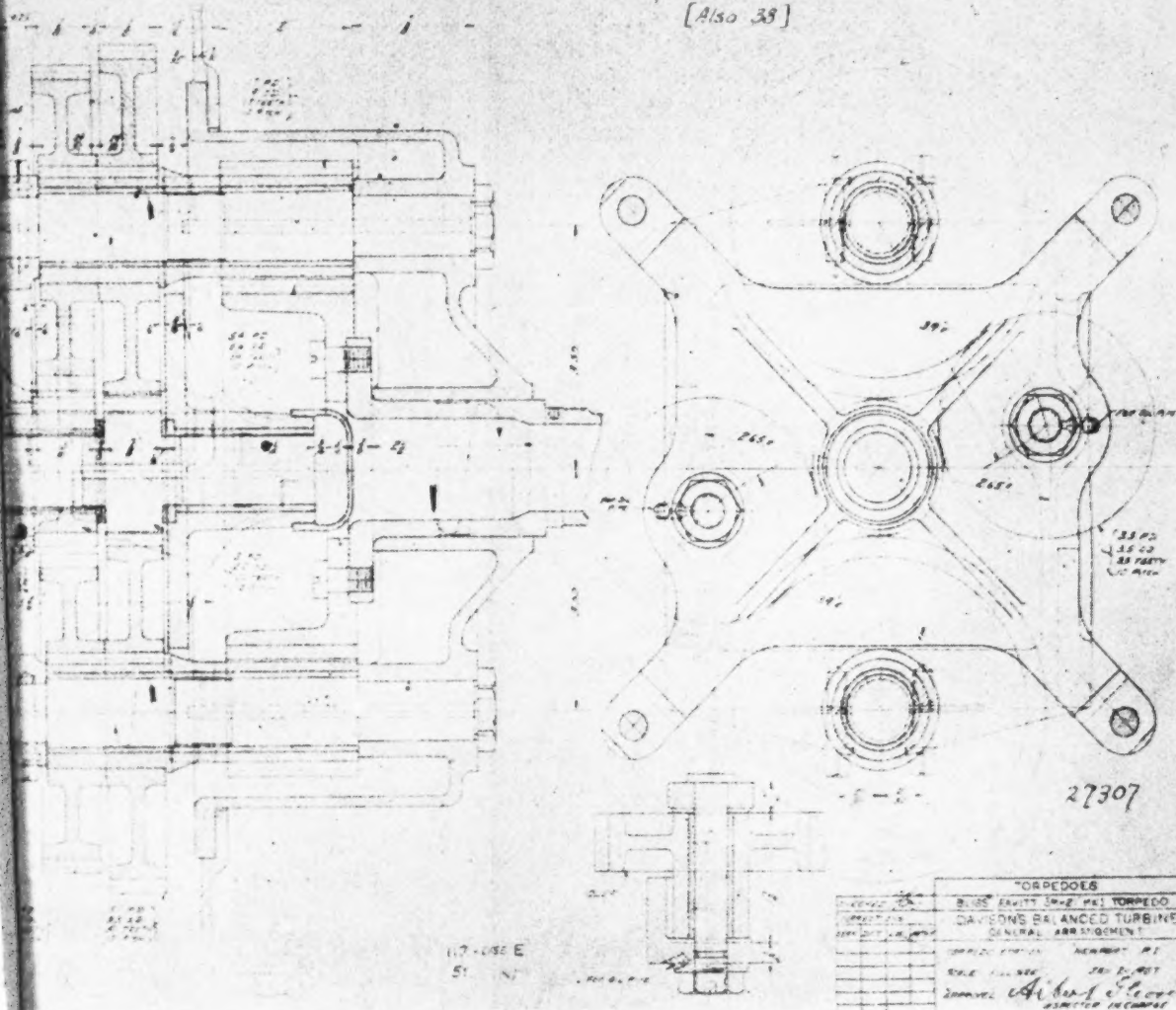
APPENDIX A.

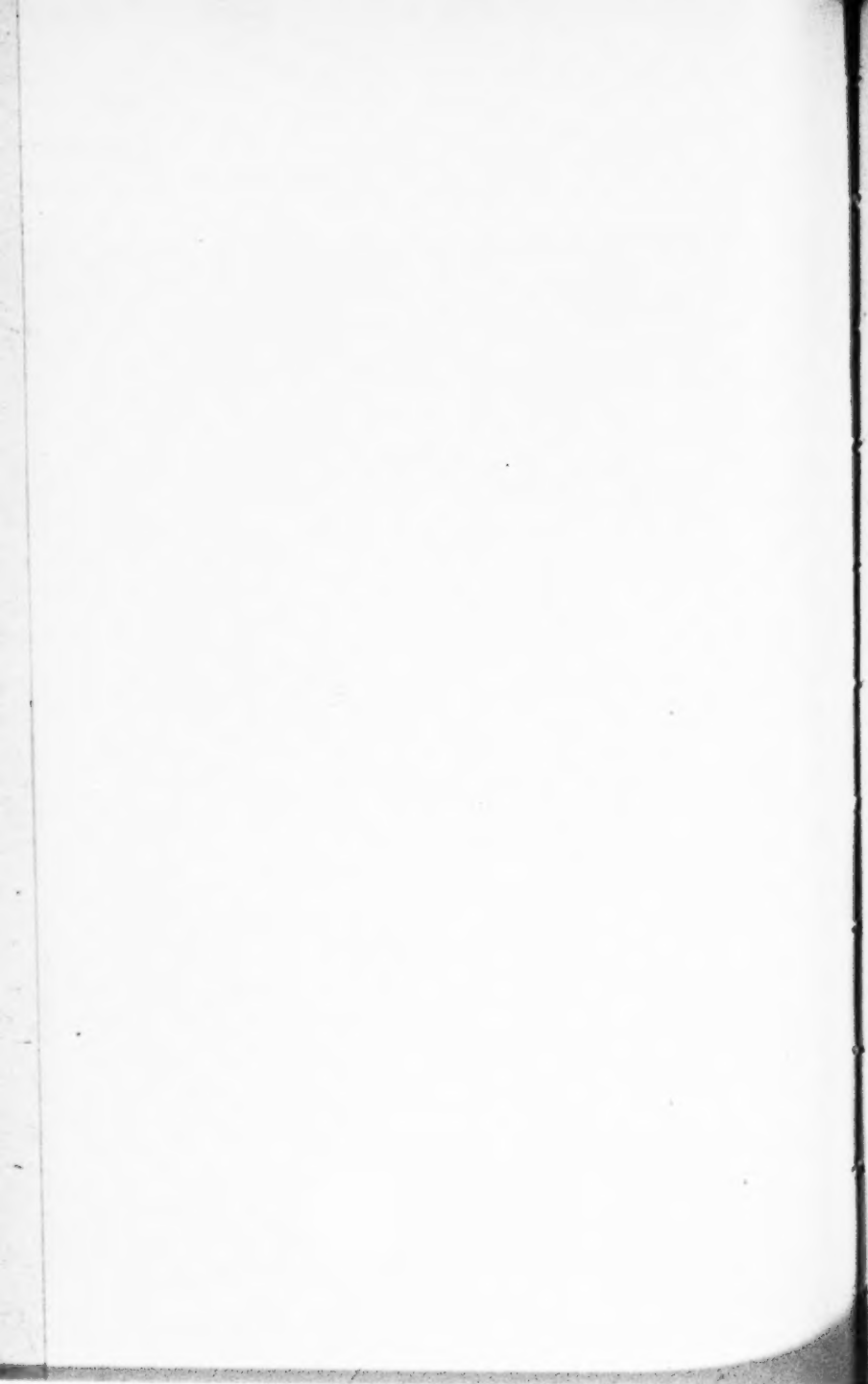
Blueprint No. 117 E, Government Exhibit No. 28.

(R. 431.)

Complainant's Exhibit 28.

[Also 38]





APPENDIX B.

ANALYSIS OF THE EVIDENCE INTRODUCED BY DEFENDANT TO PROVE THAT AT THE TIME THE DAVISON DESIGN OF BALANCED TURBINE WAS FURNISHED TO IT THE PRINCIPLE OF THE DEVICE WAS ALREADY WELL KNOWN IN THE ART.

It will be noted at the outset that defendant's contention really is limited to the claim that at the time Davison's balanced turbine was communicated to it, the principle of the *counter-rotating* turbine was a matter of common knowledge. It should be borne in mind, however, that the counter-rotating principle is but one of several essential features of a balanced turbine. These essential features are stated in the testimony of Commander Williams and Mr. Delbert H. Decker, and in the patents of Davison and Leavitt (R. 36, 66, 431, 545), and may be thus summarized: (a) Two turbines operating in opposite directions; (b) a gearing system whereby the two turbines are geared to each other, thus insuring uniformity of speed; (c) proper proportioning of weights and dimensions, so that the sum of the moment of inertia of the two turbines shall be zero. (See R. 67.)

In considering these early patents it is important to bear in mind that the gearing whereby the two turbines are limited to the same speed is a most essential feature of the balanced turbine, although it is not necessary that this gearing should be of any particular kind. The Government's patent expert, Mr. Decker, appears to have entertained the view that a balanced turbine consists only of two turbines operating at the same speed in opposite directions, and that the gearing is not an essential feature of the device. (R. 66 *et seq.*) Obviously, however, what he meant was not that the gearing was not essential, but that the *form* of the gearing was not essential, since uniformity of speed could not be maintained without the intervention of some form of gearing. (Williams, R. 49, 77.) This is indicated by the following excerpt from Decker's testimony:

Q. Do you find any differences between the structure or device shown in that blueprint and that shown in figures 3 and 4 of the Davison patent . . . ?

A. I find no essential difference between the balanced turbine *per se* of Blueprint 117 E and in figure 3 of the Davison patent.

Q. How about the gearing, is that essentially the same in the two cases?

A. The gearing in the two machines is different; *the gearing is simply a means of transmission of power of the turbine to the propellers, and may be of any form so far as the question relating to the balanced turbine itself is concerned.* (R. 67-68.) [Italics ours.]

It should further be borne in mind that these early inventors were not concerned with the problem of neutralizing the gyroscopic energy of turbines *used in torpedoes*, but as shown by the statements of their claims were striving simply for a more efficient utilization of power. In not one of the seven patents cited by defendant is any claim made to the invention of a balanced turbine *for use in torpedoes* embodying the three essential features above mentioned; and, indeed, five of these patents have no application to torpedoes whatever. Necessarily, therefore, these early inventions bear little or no resemblance to the balanced turbine developed by Lieutenant Davison, as a brief analysis of the several patents will show:

(1) *The five patents having no application to torpedoes.*

(a) Curtis' U. S. Patent No. 566,968 of 1896. (R. 446.) The object of this invention is stated to be "to convert the energy of steam or other elastic fluid under pressure into mechanical power by utilizing its *vis viva* or velocity in a turbine in such a manner as to secure not only a higher efficiency, but also a much lower speed of revolution . . . , as well as increased simplicity of the apparatus."

The specifications make no provision for the intergearing of the turbines or for the proper proportioning of weights and dimensions, and no claim is made that the turbines will revolve at equal speeds.

(b) Parson's U. S. Patent No. 729,215 of 1903. (R. 462.) Relates to steam turbines and has for its object the reduction "of the required angular and peripheral velocities, thus avoiding the difficulties of gearing down and to minimize the frictional losses due to rotation in the low pressure steam; while greatly improving the efficiency of the turbine itself."

As in the case of the Curtis patent no provision is made for the intergearing of the turbines or for the proper proportioning of weights and dimensions, and no claim is made that they will revolve at the same speed.

(c) Wilson's British Patent No. 12026 of 1848. (R. 515.) This invention, according to the title of the patent, relates to "improvements in certain kinds of rotatory engines worked by steam or other elastic fluids, part of which improvements are applicable to rotatory engines worked by water or by the wind, also an improvement in safety valves for steam boilers."

The specifications provide for a contrivance whereby "two wheels are impelled round in contrary directions" and for the connecting of the two wheels "by intervention of suitable

wheel-work or pulley-work." While such an arrangement probably would result in the wheels revolving in opposite directions at the same speed, no provision is made for the proper proportioning of weights and dimensions, and the apparatus bears no resemblance to a balanced turbine.

(d) Brady's U. S. Patent No. 643,938 of 1900. (R. 538.) The object of this invention is stated to be "to provide a construction adapted to withstand and to utilize for power either steam or gas under high pressures and in which the several revolving parts are not subjected to undue frictional contact on account of such high pressure."

This patent specifies an arrangement of cogs whereby the energy generated by two turbines operating in opposite directions is conveyed to a single shaft, and this arrangement probably would result in the two turbines operating at the same speed. This, in itself, is not the *object* of the invention, however, and the other essential features of a balanced turbine are missing.

(e) Boyce's U. S. Patent No. 693,946 of 1902. (R. 541.) As stated in the patent, the main object of this invention "is to provide a turbine in which the main driving-blades are so arranged as to avoid the necessity of having fixed guides, and thereby saving the energy which is lost by friction and the impact of the jet of fluid upon such guides."

Here, as in the Brady patent, provision is made for the gearing of two oppositely rotating turbines to a single shaft, but no provision is made for the proper proportioning of weights and dimensions and no claim is made to the invention of a balanced turbine.

(2) *The two patents relating to torpedoes.*

(a) De Ferranti's British Patent No. 9496 of 1904. (R. 468.) This invention has for its object "to effect improvements in turbine installations so as to make them specially suitable to the propulsion of motor torpedoes, submarine boats, and any other boats or vehicles where it is desired to have a simple plant working from stored energy not only contained in the combustible, but also in the form of compressed air, compressed gas, liquid air or gas, or a compound such as slow burning powders and the like, which are capable of giving off heat energy without the employment of oxygen derived from the external air."

Following is the only reference to the engine contained in the specifications: "According to my invention, I construct torpedoes of the Whitehead type and instead of fitting them with engines as at present, I supply the motive power by means of a multiple impact turbine having two oppositely running wheels, *a*, of any known type, which drive screws, *b*, preferably without intermediate gearing in opposite directions on two concentric shafts." [Italics ours.]

In other words, as admitted by Mr. Arthur S. Browne, defendant's patent expert, this device simply consists of two oppositely rotating turbines, each of which is connected with a separate shaft, without the intervention of any form of gearing. (R. 126.) This device, therefore, is distinctly different from a balanced turbine, for the reason that no means is provided by which the two turbines may be limited to the same speed.

Moreover, no claim is made to the invention of a balanced turbine or even a counter-rotating turbine; the claims, so far as they relate to compressed air turbines, covering only a method of heating the air to increase its power—i. e., a superheater.

(b) Wheelless' U. S. Patent No. 818,987 of 1906. (R. 517.) The inventor states the object of his invention as follows: "My invention relates to improvements in automobile torpedoes; and it is intended to provide improved mechanism for steering the torpedo or guiding it in the horizontal plane."

As in the case of De Ferranti's patent, the specifications call for a counter-rotating turbine with each turbine connected with a separate shaft and without the intervention of any form of gearing, as shown by the following excerpt: "By having the driving engine or engines in the form of a turbine fast on the propeller-shaft a very high speed of the propeller is secured and a consequent high speed of the torpedo."

Finally, as indicated in the statement of the object of the invention, no claim is made to the invention of either a counter-rotating or of a balanced turbine, the claims being limited to a mechanism for steering the torpedo in the horizontal plane.

(3) *Leavitt's experimental turbine of 1897.*

Mr. Leavitt testified that in 1897 he designed a counter-rotating turbine which during the following year was installed in a Whitehead torpedo and subjected to tests at Sag Harbor (R. 170-177); and his testimony is confirmed in certain particulars by Mr. Longacre, who prepared the drawings for him (R. 161-168), and Mr. Curtis, with whom he consulted concerning certain features of the device. (R. 215-223.) The device is thus described by Leavitt: "There are two turbine wheels rotating in opposite directions on a shaft which runs across the torpedo, these turbines are connected through gearing with the two propeller shafts which revolve in opposite directions; there is a train of gears on each side which connects each turbine to the two shafts, so that each turbine drives each of the two revolving shafts; either one will drive both shafts." (R. 172.)

The arrangement of gearing thus described necessarily resulted in the two turbines revolving at the same speed, but

no mention is made of any effort to proportion weights and dimensions so as to secure a perfectly-balanced turbine; and however much the device may have resembled a balanced turbine, when tested in a torpedo it proved to be an inefficient means of propulsion. Concerning the result of the tests, Leavitt testified.

Q. How did the torpedo operate?

A. It operated all right except that we did not get the speed we hoped to get.

Q. Was the speed faster or slower than the Whitehead torpedo of that date?

A. It was slower. (R. 174.)

During these tests the torpedo containing this device met with an accident and the engine was completely demolished. (Longacre, R. 165; Leavitt, R. 174, 175.) Thereupon the device was abandoned (Leavitt, R. 179); no application for a patent covering the device was made, and it was not mentioned in the application for a patent covering the unbalanced turbine made by Leavitt in 1902. (R. 438.) Moreover, it will be recalled that when, a few years after these tests, Commander Fisk suggested to Leavitt that he design a turbine for use in torpedoes, the latter was unwilling to guarantee the outcome of his experiment because "no one knew enough about the action of compressed air on turbines to give any guaranty." (*Supra*, p. 4.)



Supreme Court of the United States

OCTOBER TERM 1912

Nov. 15, 1912

E. W. BLISS COMPANY

Appellant

UNITED STATES

Respondent

UNITED STATES

Appellant

E. W. BLISS COMPANY

Respondent

SUPPLEMENTAL BRIEF FOR APPELLANT, E. W. BLISS
COMPANY

PLATT & FIELD

Attorneys for Appellants

FRANK H. PLATT
ELI I. BLAIR
Of Counsel

Supreme Court of the United States,

OCTOBER TERM, 1918.

E. W. BLISS COMPANY,
Appellant,

vs.

THE UNITED STATES.

No. 15.

THE UNITED STATES,
Appellant,

vs.

E. W. BLISS COMPANY.

No. 16.

SUPPLEMENTAL BRIEF FOR APPELLANT E. W. BLISS COMPANY.

Owing to the omission of one of defendant's exhibits from the printed record, appellant respectfully calls attention to the following:

On October 21, 1905, the Government sent to the defendant, Bliss Company, printer's proof of the proposed contract and specifications (Complainant's Ex. 19; p. 316). In its letter of October 21, 1905, the Government stated:

"Your attention is specially invited to the new clause (Nineteenth) which has been added to the contract on a typewritten sheet * * *."

This typewritten sheet, being the first draft of the Nineteenth paragraph, as proposed by the Government, was received in evidence as Defendant's Exhibit 116 (p. 136). It was by inadvertence omitted from the printed record. It reads as follows:

"NINETEENTH: It is hereby expressly further stipulated, covenanted, and agreed, that the party of the first part will not exhibit to any person or persons other than duly authorized representatives of the party of the second part any torpedo or any part thereof manufactured or to be manufactured under this contract, except by permission in writing of the Chief of the Bureau of Ordnance; that the party of the second part will furnish to the party of the first part all possible information, advice, and suggestions, looking toward the further improvement and development of such torpedoes; that the party of the first part will not make known or communicate to any person or persons, except duly authorized representatives of the party of the second part, any such information, advice or suggestions, or any other matters furnished to it by the party of the second part or its representatives, except by permission in writing of the Chief of the Bureau of Ordnance; that the party of the first part will not, in the manufacture of torpedoes for any person or persons, firms, corporations, or others, or other governments than the party of the second part hereto, employ or make use of any of the information, advice, suggestions or knowledge, or of any mechanical or other methods, ideas, devices, or designs furnished, conveyed or suggested to it by the party of the second part or its representatives; that in case of breach of these provisions on the part of the party of the first part, the party of the second part shall be at liberty to cancel this contract and to proceed with the manufacture, by contract or otherwise, of the torpedoes herein contracted for, including all improve-

ments without payment of royalty, license fee, or other charge, on account of the use therein or in the manufacture thereof of any models, designs, devices, appliances, methods or ideas, or other features invented or suggested to or communicated to the party of the first part by the party of the second part or its representatives; that in case of such breach all torpedoes with the designs, drawings, patterns, models, and prepared material therefor, on account of which payment in any amount shall have been made under this contract, shall become the property of the party of the second part and shall on demand therefor be delivered to it by the party of the first part, and any and all sums of money or payments due the party of the first part by the party of the second part under this contract shall be forfeited to the party of the second part, and the party of the second part shall thereby and thereupon be released and discharged from all and every claim or demand of any and all kinds whatsoever on account of this contract."

This clause was not acceptable to the Bliss Company and the Government withdrew it and substituted a paragraph essentially different.

On October 25, 1905 (Complainant's Ex. 18; p. 317), the Government wrote:

"In pursuance of further conversation with Mr. Leavitt, the Bureau encloses a copy of a proposed change in the clause of the contract relative to the use by you of devices invented by officers of the Bureau. Is this clause as modified satisfactory to you?"

The amendment of October 25, 1905, is in evidence as Complainant's Exhibit 18A (p. 318). This amendment was carried into the contract with the addition of the following proviso, which proviso was

added by the Government and submitted with its letter of October 28, 1905 (Complainant's Ex. 16; p. 319):

"Provided furthermore that no device or design shall be considered as coming within the provisions of this clause, unless the party of the second part (United States Government) shall state to the party of the first part (Bliss Company) in writing, at the time when the said device or design is itself conveyed to the party of the first part (Bliss Company) by written communication from the party of the second part (United States Government), that the party of the second part (United States Government) consider that the said device or design is embraced within the provisions of this clause" (p. 386).

Respectfully submitted,

PLATT & FIELD,
Attorneys for Appellant.

FRANK H. PLATT,
ELI J. BLAIR,
Of Counsel.

16.

Mr. George W. Field, with whom *Mr. Frank H. Platt* and *Mr. Eli J. Blair* were on the briefs, for appellant:

To furnish a design, it is necessary to furnish something concrete. So of a device. One cannot exhibit an idea. A device has been defined as a thing "devised or formed by design; a contrivance; an invention." "Device" meant some contrivance which could be installed in the torpedo.

The Government has published by the Davison patent and otherwise the nature of the balanced turbine and has therefore waived secrecy. This clause must be construed against the Government because drawn by it. Further, it is a restriction on the defendant's power of alienation of its own property.

It should be construed to avoid absurdity or unfair advantage to one party over the other. *Bell v. Bruen*, 1 How. 169; *Sanford v. Brown Brothers Co.*, 208 N. Y. 90.

The balanced turbine principle being public property, the Government could not furnish it to the defendant.

The purpose was to prevent knowledge of new inventions going to the other nations. By the issuance of patents, both domestic and foreign, this purpose is frustrated by the plaintiff itself.

As no irreparable injury can be suffered by repetition of such knowledge, injunction was improper.

The position of the defendant is analogous to that of the holder of a trade secret. Once a trade secret has become generally known, regardless of the contract between the parties, its further promulgation will not be protected by injunction. *Bell & Bogart Soap Co. v. Petrolia Mfg. Co.*, 25 Misc. (N. Y.) 66; *National Tube Co. v. Eastern Tube Co.*, 23 Ohio C. C. 468; *Chain Belt Co. v. Von Spreckelsen*, 117 Wisconsin, 106.

Mr. Assistant to the Attorney General Todd, with whom *Mr. A. F. Myers* was on the brief, for the United States.

37.

Opinion of the Court.

MR. JUSTICE MCKENNA delivered the opinion of the court.

Appeal from a decree of the United States Circuit Court of Appeals amending and affirming a decree of the District Court for the Eastern District of New York entered in a suit brought by the United States against appellant (herein referred to as the Bliss Company) restraining the latter from exhibiting or communicating the construction and operation of a torpedo known as the Bliss-Leavitt torpedo.

The controversy turns upon the construction and application of certain clauses of the contracts between the Bliss Company and the United States and is not, we think, in broad compass. In support of its contention in the main the United States has the sanction of the two courts.

The development, construction and operation of the torpedo gave animation and attraction to the argument, but it is enough to say that its method of propulsion is the balanced turbine method, so called, that is, turbines revolving in opposite directions. The United States asserts that to this method of propulsion the excellence and efficacy of the torpedo is due and that it was the conception of the United States; that it was the result of much experimentation on the part of its engineers and those of the Bliss Company and the expenditure of substantial sums of money by the Government, and that because of the superior speed, range and power of this new weapon, other nations have been eager to learn the secrets of its construction.

The Bliss Company denies these assertions, opposes them, besides, by the contentions that the balancing of rotary bodies analogous to turbines rotating in opposite directions was a matter of common knowledge long prior to any transactions with the United States and that the